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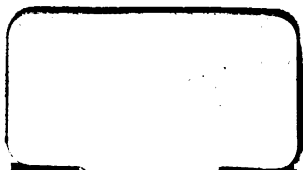
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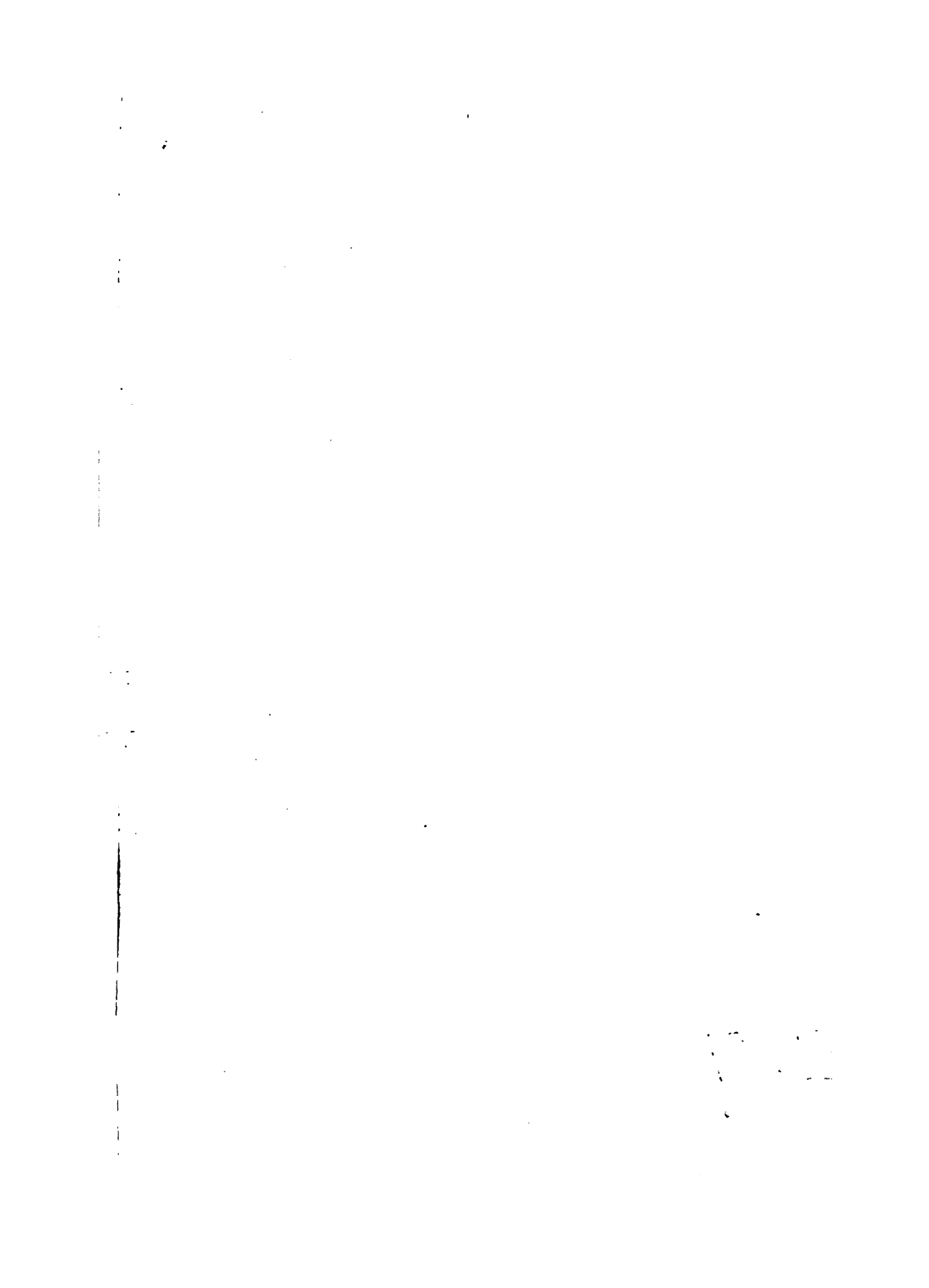
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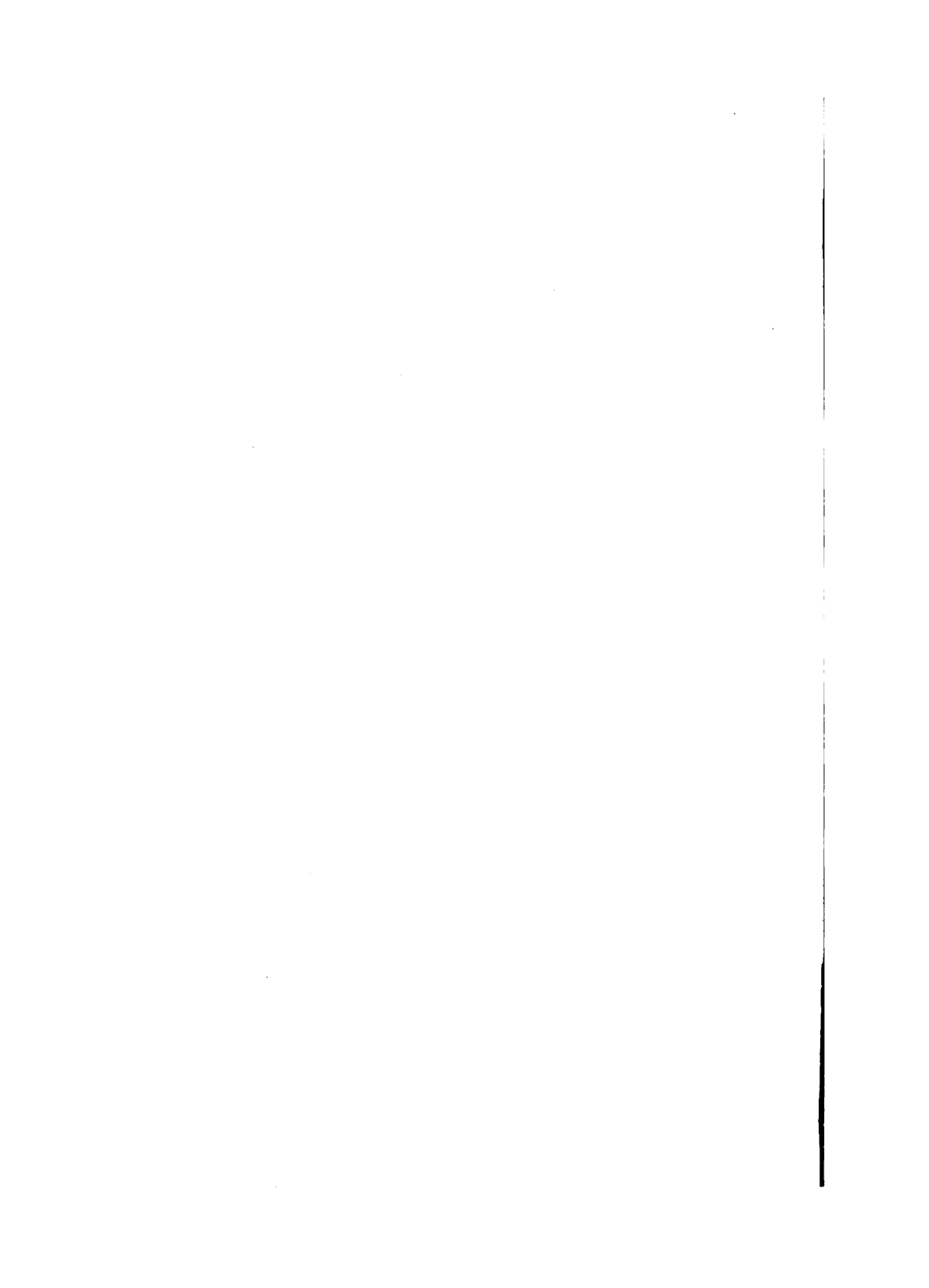




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EVOLUTION AND THE WAR



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EVOLUTION AND THE WAR

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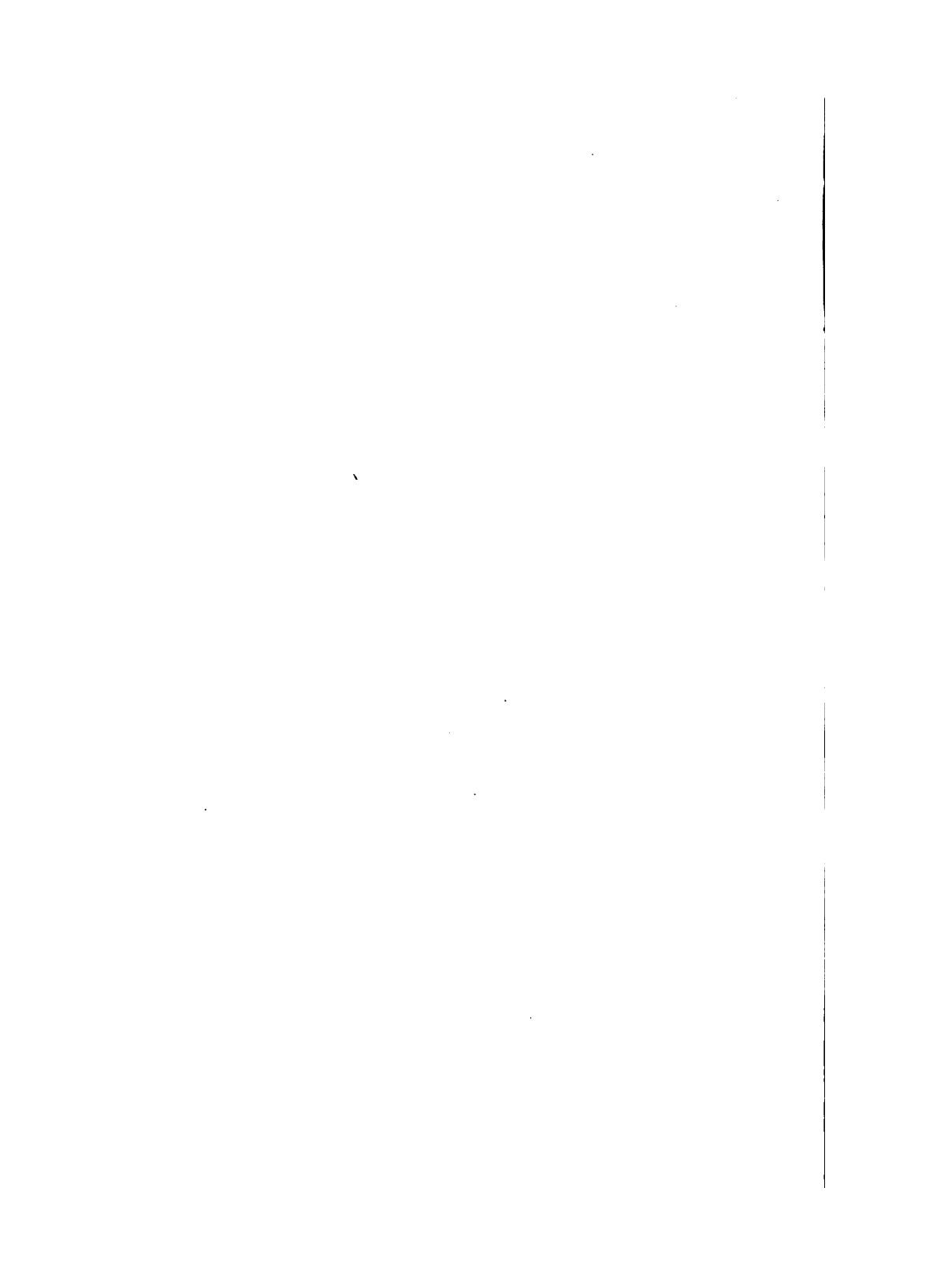
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PREFACE

THIS little book is based on three lectures on "Evolution and War," given at the Royal Institution in February, 1915. The lectures were delivered orally, with the assistance of notes, and as soon as possible afterwards I wrote out what I had said, rearranging the matter in a form more suitable for reading, and adding some details for which I had no time at the lectures. I have also made fuller reference to contemporary events than was permitted by the custom of the Institution.

Although the lectures would not have been given but for the war, the ideas that underlie them are not a by-product of current politics. The points of resemblance and difference between nations and species I discussed, on similar lines, in an article published in *The North American Review* in October, 1904. In the account of race and nationality, given in Chapter III, I have followed in broad outline the facts that Professor Ripley has presented so lucidly in *The Races of Europe*. In a strictly anthropological discussion, many minor considerations, some of them dealt with by Dr. Ripley himself, others raised by other anthropologists and ethnologists, would have to be reviewed. For the present purpose, these would obscure needlessly that clear statement of the fundamental distinction between race and nationality

which is urgent just now. So far as I have made use of them, Ripley's conclusions can be confirmed by any observant traveller who goes through Europe in the old way by road, and is not content with international trains, international hotels, and large cities.

The way in which the distinction between men and animals is glossed over by the two fashionable schools of modern thought, and the misleading fashion in which observations on inheritance in plants and animals have been extended to human qualities, I have criticized in many occasional articles. The attempt towards a theory of consciousness which I sketch in this book is foreshadowed in my book on *The Childhood of Animals*, published in 1912, and in an address on *Science and Life*, published early in 1914.

If I may be permitted a comment on my own work, it is that a serious presentation of some difficult biological problems is submitted here in a slight and topical form.

P. CHALMERS MITCHELL.

London, *March*, 1915.

INTRODUCTION

WE live in resounding times the issue of which no man can see. Already those in high places throughout the world are trying to distinguish between the final issues that seemed so fateful in the end of last July and the deep currents that hurried the nations into the abyss of war. When the time comes to see events in perspective, historians may give a verdict less coloured by the prepossessions that now rightly beset us. In this little book I discuss a theory of war, rather than an actual war, or its causes. But partly as an introduction which may explain a bias I am at no pains to conceal, and partly as a small contribution to the data for historians, I submit here a statement of the reflection thrown by Germany since 1884 on a private person whose activities have been far removed from the considerations that may be supposed to influence statesmen, and who has had nothing to hope or to fear from Governments, international commerce or high finance. I am a Scot, and all Scots, they say, are politicians, but at the least I have been in every sense of the word an unofficial politician.

In the spring of 1884 I was a new-made and somewhat premature graduate of the University of Aberdeen, with a little money and at a loose end until October, when I was due at Oxford. I decided to

spend the interval in Germany, the choice being determined, I think, from the accident that a friend in similar case was going there. I had hardly been out of Scotland before ; a trip to Oxford for a scholarship examination and a week-end in London were my materials for knowledge of the great world. I knew such history as was forced on reluctant boys in a Scottish provincial school of which classics were the ideal, but I had read for my own pleasure Clarendon's *History of the Great Rebellion*, Carlyle's *Frederick the Great*, and Justin MacCarthy's *History of our Own Times*. Goethe I knew, and a few of the poets in translation ; Schopenhauer had bored me, and Kant had beaten me, but the shining, fragile net thrown by Hegel over the universe had enchanted me, and I was deep-read in Stirling's *Secret of Hegel* and in Wallace's *Logic and Prolegomena*. All this to show that for me Germany was not a Power among other European Powers. Old philosophy and young life were all I cared for. If I had any notion of patriotism it was as of an accident of locality, like a Scotch accent, to be worn bravely, but to be rubbed off as quickly as might be.

Berlin was the first great city in which I had lived, and the days passed quickly. We read German in the morning, dined at four as paying guests in a German family, and supped in a beer-garden. Berlin was then a dowdy provincial town, the capital of a province rather than of an empire, and I recall chiefly the gracious presence of trees, the trees of Unter den Linden, the trees of the beer-gardens, the trees round every corner, the forest coming up to peer through the Brandenburger Gate, not yet

scarred with the beginnings of the baroque magnificence that now stretches to Charlottenburg and Potsdam. Other impressions I remember came from the revolting simplicity of the sanitary accommodation, although we had fine rooms on the first floor of a house a few yards from the Pariser Platz; the swift silence that fell a few minutes after midnight, the Cafe Bauer alone flaunting through the night; the great rush of business people pouring into the streets at midday, and all Berlin, in denser throngs than I had seen or imagined, filling the open places in the evenings and on Sundays. Two things only gave me the shock of feeling that I was an alien in an alien country. We had treated the police-slips presented to us by the landlady, I suppose, in a casual way, and we must have got at cross-purposes with the inspector who promptly paid us a visit, for we entirely failed to convince him of the exact truth, that we had no business of any kind in Berlin. We were neither students nor in commerce; we didn't know why we had come to Berlin, and we had no views as to how long we were going to stay or where we were going afterwards. Possibly a Scotch accent was unfamiliar to the inspector, for the police took notice of us in a very open way, until after a few days we sought out the Embassy and stated our case. An agreeable young Englishman put some shrewd questions, laughed, and bestowed on us a lithographed document, in which Lord Odo Russell, in the name of Her Britannic Majesty, threw over us the protection of the British Empire in polite but peremptory words. At that moment patriotism was born in me; the differences between the nations had become a

practical affair of daily life, and I entered with pride and gratitude into my inheritance as a citizen of no mean city.

The second slight shock came from the overwhelming presence of soldiers. The army I knew as a remote part of the organization of our Empire, but soldiers were tucked away in barracks or walked out with the housemaids on Sundays. I don't suppose I had ever spoken to an officer, and certainly had never seen one in uniform except with his regiment. But Berlin was an armed camp. Regiments marched through the streets, interrupting the traffic; the windows shook with the rush of artillery; the pale old King was driven swiftly in the middle of a glittering cohort; officers unhooked their belts and hung their swords on the coat-stands of the restaurants and strode through the rooms taking, rather than being given, precedence. It was new to me to find soldiering the urgent business of a State.

In early summer I paid a visit to a German country house near the Baltic coast, in response to an invitation that came through Scotch relations. I spent some time in various houses in Pomerania and West Prussia, for I was handed on as a guest from household to household. There, in the real Prussian country, among the almost feudal Prussian gentry, the dominance of militarism leapt to the eye. The heads of the houses were retired officers, the sons were active officers, the men-servants were old soldiers, the coachmen and gardeners, the peasants in the fields stood at attention as we came near them. In all classes, there was as much difference between the well-groomed and soldierly males and the

homely women as between a cock pheasant and his mates. But in Prussia also I experienced for the first time the amazing *Gastfreundlichkeit* of Germany, something warmer, more intimate and adopting than the best of English hospitality, a quality that to my mind has done much to dim the eyes and dull the ears of the many able, informed, and honest men who have brought back to England a false report of Germany's national purpose. It is a quality that I believe to be entirely innocent and unassumed, as innocent and unassumed as its counterpart, the odd way in which a German will sometimes confide in you his scheme for your own undoing. Many years later, when I was secretary of the Zoological Society of London, a German zoologist unfolded to me, in my office in Regent's Park, his scheme for establishing, with German capital, a Hagenbeck Zoological Park in London, which, he assured me, would wipe us out in a season. He was uncertain as to the most suitable part of London to select for the enterprise, and wished my advice and assistance in choosing and obtaining a site. I know that he did not think me a fool, as he had asked for, obtained and adopted many suggestions of mine with regard to the establishment he controlled in Germany, and he was an honourable man who would not have thought of bribing me. But his was a great scheme, which any man of experience and intelligence must value, which any friend must help.

I am still grateful for so much kindness that I close the pages of my memory of these summer Prussian days, even upon some curious and in a small way entertaining sidelights on persons bearing great

names in German history, with whom I came in contact. But one circumstance, wholly unintimate, leads up to what I wish to tell. Bismarck was a familiar of the last house in which I stayed, and there was a good deal of talk about a Parliamentary measure for which he was at the moment preparing. The idea was to give Government subsidies to certain shipping companies to enable them to run lines of steamers to Africa, and there was difference of opinion as to how far this would divert money from the army, if it meant building a great fleet, how the step would be viewed in England, and kindred problems now familiar to all the world. To me at least they were quite new and very interesting. I asked if I might be told when Bismarck was going to introduce the Bill in the Reichstag, and I was promised not only that information but a card of admission.

Not long after I returned to Berlin, a dated ticket was sent me, and I went to the Reichstag at the appointed hour. Almost at once, as it now seems to me, Bismarck came through the private entrance of a little raised box, facing the semi-circle of members. From my seat I looked straight across at the stiff figure in some kind of uniform, and the grey, impassive face, very remote and formidable. He spoke in a husky monotone, difficult to follow, and almost without inflection or gesture. He was listened to in complete silence, and I had the impression of a stern and rather bored professor giving instructions to a docile class. He stopped abruptly, and at once a wild clamour of jubilant and angry shouts arose, almost as suddenly resolving itself into a single, thin, and screaming voice. The voice came

from a small stout man, with a red face flaring through a tangle of white hair and beard. He had a bundle of papers clenched in each outspread, gesticulating hand, and he was leaning forward as if his passion of fury could reach across to Bismarck. Bismarck had never sat down; he paid not the slightest attention to the tumult, but slowly gathering some papers from the low desk in front, he turned round stiffly and disappeared, leaving his opponent screaming with redoubled fury. And so, I believe, the World-policy was launched by Bismarck himself in 1884.

For the remainder of my time in Berlin I was interested in politics, and discussed England and Germany as often as I had the opportunity. William Minto, formerly editor of the London *Examiner*, then Professor of Logic and English at Aberdeen, had been very friendly to me, and had given me introductions to people in Berlin, which I now used. These people were Radicals, of internationalist and pacifist tendency, and they not only distrusted Bismarck, but were convinced that the reign of blood and iron was over, and that the dawn of international peace was at hand. They thought that Bismarck's policy was doomed, and they had a good deal to say of what would happen when the old King was succeeded by his peaceful son, but they were convinced as to the intention and design of the new bill. The subsidizing of commercial steamers was to be a first step in the preparation of Germany for a fight with England for the mastery of the world.

I find in my note-book of 1884, preserved by a

lucky chance, a record dated Berlin, June 22nd, of a conversation with one Mr. F. Who precisely Mr. F. was, or how I came to know him, I cannot recollect, but I have a clear impression of him as an intelligent middle-class man of no particular education who had been much in London, probably in trade, and who took pleasure in instructing me, whom he knew to be Scotch, about England and Germany. It seems to me now a record of much interest as to the envisagement of the political situation in 1884 by a quite ordinary Berliner.

"The English," he said, "have much more of a family life. It is rather difficult for a foreigner to feel quite at home with them. They are probably quite as hospitable as the Germans, but they do not show it so much. There are about 100,000 Germans in London, and with business people they are far from popular. The English do not educate the common people enough so that these would rather have better food than better education for their families, and the upper classes don't combat this idea enough. The Germans are therefore more pushing and get the best places when they have got into a business."

"North and South Germany have to be better amalgamated before the Empire can fulfil her destiny, and it takes more than a dozen years to unite people so different in habits and in mode of life. Round about Berlin the land is poor; industry and manufactures take the place of natural wealth, and, as in your Scotland, the people are more fitted to battle with life. When they go to the rich Rhenish provinces or to Bavaria; their northern habits enable them quickly to outstrip their easy-

going competitors. When a Bavarian has gathered, as he may quickly do, 20,000 marks in his little business, he retires, as he can be quite happy and comfortable on his income. Not so the northern ; he at once begins to use his capital in larger ventures, and probably when he has got together a much larger fortune than would content a Bavarian, he takes back his wealth to his Prussian home. The rich southern provinces and the fat Rhinelands take it amiss that the centre of power should be in the sand-hole of Germany. Had Germany lost the first battles in the late war, the southern provinces would of course have crossed at once to France. But the German people are getting together now, and before long will be ready as a single nation."

"The French are burning for another war, naturally enough, it must be admitted. A visit to Berlin must be very nauseous for a Frenchman—to see the trophies and plans in the war museum, the victory column with the French cannon, the galleries filled with military pictures of victories over the French, the panoramas of the siege of Paris and of the battle of Sedan, the preparations for the new Reichstag buildings, to be built with French money. Germany is not yet so wealthy as France, but it was then and certainly is now much more ready for sudden war. The feeling in Berlin during the last war was intense uncertainty changed to wild exultation. Ever since, our preparations have been going on slowly. The railways are State property and are prepared expressly for war. At immense cost railways have been built straight to Metz and Cologne. Another has been built round Berlin, so that troops

arriving from any quarter can be sent in any direction without changing carriages. The day after war has been declared, we can hurl 800,000 men to the frontier ; in three days another 400,000 can be sent. Germany's hope is to strike a sudden blow, as she did against Austria and France, and for this purpose our military organization is kept up as if we were at war."

"Germany must be ready for any emergency. Her relations with England are cold enough. With Austria and Italy she is friendly, but they are not strong allies, and the Hungarian half of Austria hates us bitterly. With France, Germany's relations are of the most volcanic character, and Denmark hates us. But Russia is our nearest enemy ; she fears us, and not without reason, for we want the Baltic coast up to St. Petersburg. Russia is a serious enemy, and she is your enemy too. She wants to take India, and India she will have. Your country should never have treated her so tamely over Afghanistan ; your Lord Beaconsfield was a great man and understood this, but Mr. Gladstone is a fool, since he doesn't want to crush Russia."

"But perhaps India is not so valuable after all, and the stories of her boundless wealth are invented by the newspapers. Africa is the land of the future. You have colonies in the south and in the north-east, and the French are strong in the west, so that there is not much left for us. But Germany must become a mother of nations ; we must have lusty sons. When England, France, and Germany come to blows over Africa, as nations of old fought for India and America, the well-trained German will prove a strong enemy.

What use will your great fleets be when we are fighting you in the wilds of Africa? The history of the greatest struggle the world has yet seen must be written before long, and it may fall to a German poet, with the goodwill of the victor to the vanquished, to sing the praises of a British Montcalm."

I think that everyone must agree as to the remarkable character of these notes, written thirty years ago. Had I been a student of international politics, a historian or a journalist, it would be possible to discount something from them. But I was none of these things, and wrote them down among trivial personal incidents, only because I was powerfully impressed to find that a great country was preparing for war as the natural avenue to her future. When I was arranging the lectures that are the occasion of this little book, I remembered vaguely my Berlin notes, and to my great delight found them. On re-reading them, I am still more impressed, and cannot doubt but that so long ago as in 1884, when there were no clouds between England and Germany, the German nation, not merely a war party, or a political school, had foreseen and was preparing herself for a struggle to the death with England.

Before I proceed with this personal narrative, let me repeat that I am merely trying to show how the ripple made by the great affairs of Germany affected the mind of a single person. I lived in Oxford from 1884 until 1893, first as an undergraduate and then as assistant professor, and so forth. Nearly every year I spent some time in Germany, for the most part either in Leipzig or Dresden. But two things

were happening to me mentally. First I was becoming more and more absorbed by zoology, for I was a professional zoologist. Germany acquired a new significance for me ; it was not a great nation among other nations, but the place where certain laboratories and universities were situated, the country of Leuckhart and Weismann, Wiedersheim and the Hertwigs, and of a host of other and younger men whom I came to know personally or by correspondence. I read German, abstracted German, published translations of German, but it was all technical, zoological German, and when I was in Germany talking with Germans, the theories of heredity or the origin of mesoblast and not the political designs of our respective countries interested us.

The second mental event was the dawning of Russian and French literature on me. Before I went to Oxford I had read no Russian author, and little in French, except school-books. It was the accident of reading Russian with W. R. Morfill for a technical purpose, that led me to Pushkin and Lermontov, Gogol, Dostoevsky and Tolstoi, and so to a new aspect of life, sweeter, richer and more compassionately objective than anything I had imagined. French I read from design, at first merely to provide an interest remote in manner and matter from my daily work, afterwards as an increasing delight. Here for the first time I shall admit what you shall call prejudice if it please you. I began with Balzac, and I have gone on to Jules Romain, and probably for the last twenty years there has been no day in which I could read and have not spent half an hour with a

French book. Let those who know appraise the style of modern French writers and assign their due place in the roll of fame to Gautier and Flaubert, Zola and de Maupassant, Stendhal-Beyle and Villiers de l'Isle-Adam, France and Loti, Huysmans and Barrès, Mirabeau and Toulet, de Régnier and Louys, Hermant and Renard, Boylesve and Colette-Willy. But who shall appraise the gift to humanity of this amazing literature of beauty and insight, of scorn and pity, and of the humaner charity of laughter? Not I; but at the least I place it above all that was ever written in the German language, far above dyes and drugs and all the material progress of Germany.

So it happened that I was entirely out of sympathy with the coldness to France and the strong pro-German feeling that dominated English society and English politics until the Boer War. This personal feeling was increased as from 1893 onwards I began to take my holidays in France, chiefly in provincial France, and by the opinion I gained from talking to people of all sorts and kinds in France that the national desire of France was to be at peace with all the world. In the early 'nineties I was writing regularly for *The Saturday Review*, usually on scientific subjects, and in February, 1896, the editor published, under the title "A Biological View of Our Foreign Policy," what I think is the only political article that I have ever written. I refer to it because Prince von Bülow, in *Imperial Germany*, quotes from it as that "famous article published in *The Saturday Review* in the autumn of 1897," treating it as one of the results of the introduction of the German Navy

Bill of 1897. It was published actually on February 1st, 1896, and whatever fame it may have had in Germany, it passed completely unnoticed by the Press in this country. England was absorbed, so far as foreign politics went, by the fear of France and of Russia, and was entirely friendly to Germany. Being without status as a political writer, and extremely anxious to do anything I could to turn opinion away from hostility to Russia and France, I took the mode of expression open to me and gave the article the form of a scientific essay. I asserted that a very large number of the wars of the past had been "mere expressions of the individual ambitions of rulers, or the jog-trot opportunism of diplomatists," but that a period was rapidly approaching when the pressure of expanding nations would lead to wars that "could not end in peace with honour, whose spectre could not be laid by the pale ghost of arbitration." I suggested that the prediction of the wars of the future, of these struggles between expanding nations, was a biological problem, and that on biological grounds it was plain that the conflict would be most certain and most deadly between species that were most similar. I went on to say :

"France, despite our historic antagonism for her, is no rival of England in the biological sense. She is not a nation that is growing and striving to expand beyond her boundaries. Her wars have been the dreams of rulers, not the movements of peoples. Her colonies have not struck roots of their own, but have remained in organic connection with the mother-country, draining their vital sap from her. In commerce, in art, in letters, in the daily business of

life, the French and the English have been complements, not rivals. France and England are bound together by a thousand endearing diversities of character; they are commensal mates, allies, not enemies.

“Of European nations, Germany is most alike to England. In racial character, in religious and scientific thought, in sentiments and aptitudes, the Germans, by their resemblances with the English, are marked out as our natural rivals. In all parts of the earth, in every pursuit, in commerce, in manufacturing, in exploiting other races, the English and the Germans jostle each other. Germany is a growing nation; expanding far beyond her territorial limits, she is bound to secure new foothold or to perish in the attempt. It is true she has not yet succeeded in making colonies of her own. But that failure is the mere accidental result of her political system. Her own revolution is imminent, and Germany, as a democratic Power, would colonize for herself with the same aptitude she has shown in infiltrating our own colonies. Were every German to be wiped out to-morrow, there is no English trade, no English pursuit that would not immediately expand. Were every Englishman to be wiped out to-morrow, the Germans would gain in proportion. Here is the first great racial struggle of the future; here are two growing nations pressing against each other, man to man all over the world. One or the other has to go; one or the other will go.”

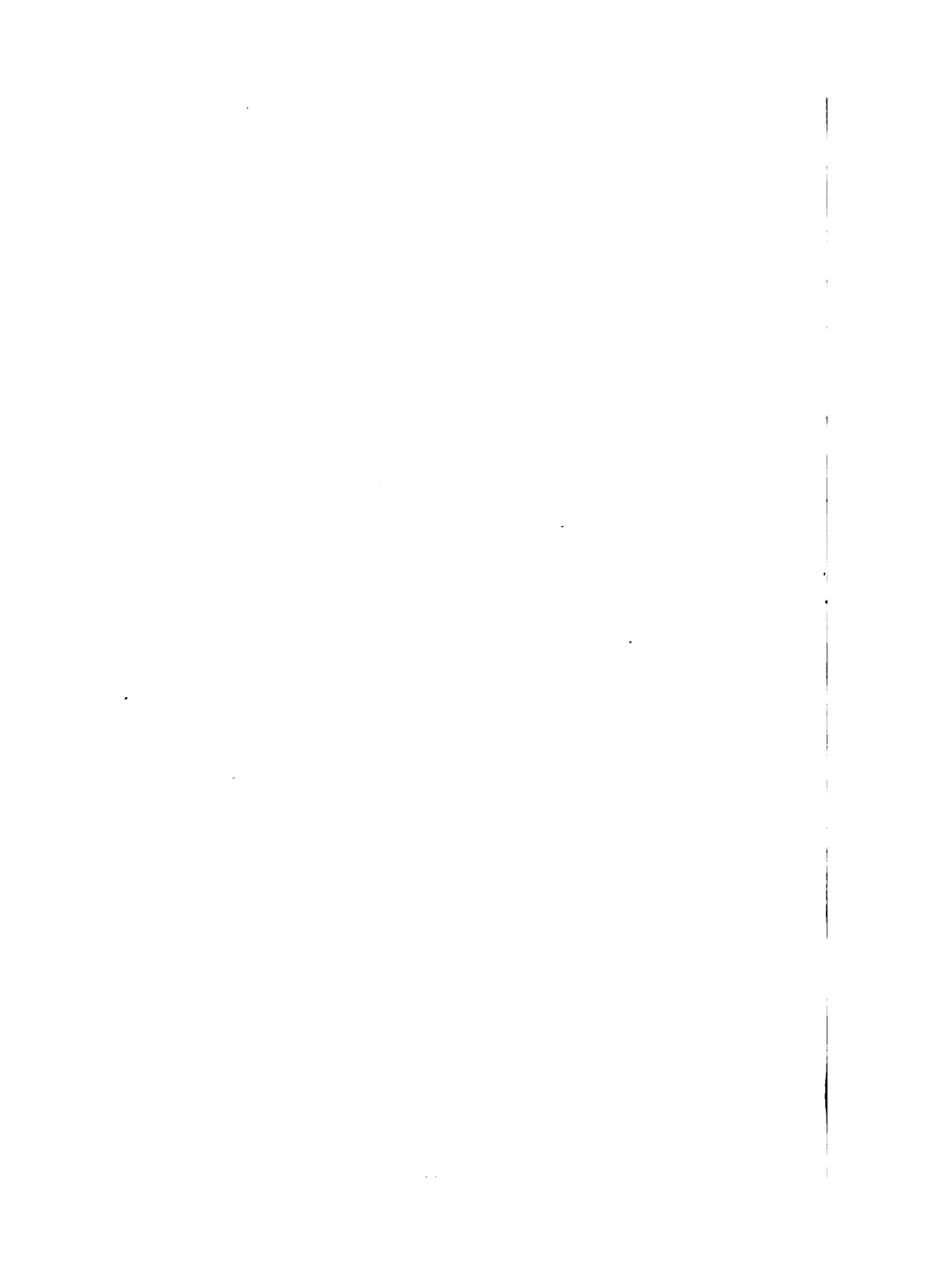
On re-reading the article I still think it was an entirely correct diagnosis of the position, on the assumption, then familiar in political discussion,

that the policy of nations must be directed by what seemed material issues. English Governments and the great English newspapers, however, pay no attention to anonymous writers, and the political party that gave Heligoland to Germany pressed on to the folly of Fashoda. So ended my little adventure in politics.

My impression is that since the Transvaal War, and still more since the success of the policy of granting self-government to South Africa, the great majority of persons in this country have desired not only peace for Britain but for the whole world. The feeling against France and Russia had disappeared, and quite certainly it had not been replaced by a feeling against Germany. The cry for a larger navy, the demand for conscription, the attacks on the Ministers of War, were regarded by most persons in private life as being due to the natural enthusiasm of professional soldiers and sailors, or as moves in the game of party politics. We pursued our private affairs through the various recent crises in foreign politics with almost complete indifference to what was going on, confident that when diplomatists had had their little "scraps," the good sense and the peaceful interests of peaceful nations would prevail. I was in Germany on business connected with the Zoological Society in 1911, 1912, and the end of 1913. I saw many places and persons that I had not seen for a quarter of a century. I find in my notes, written at the time of these visits, expressions of the most profound admiration for the new splendour of German towns, for the abounding signs of progress and prosperity, comparisons with New York and Washington, comments on what

seemed to me the rather florid taste of German art, but not a word of Anglo-German rivalry. As a matter of fact, I had completely forgotten my old feelings about Germany, and was convinced that war between great modern nations was a horror that no statesman would face. Certainly that was my own feeling and the feeling of the great majority of the people I knew, up to the end of July last year. If I may guess at matters of which I am ignorant, I hazard the opinion that the delay of the British Government, which must have seemed so strange and so sinister to the leaders of France and Russia at the time, which seems even stranger to all who now read the diplomatic history of the last days of peace, was due only to one cause. The Cabinet must have known that a great European War would have seemed an outrageous crime to Great Britain, and any abettors of it criminal lunatics, until we knew that we had to fight.

I end this personal record with two observations. To the best of my belief and judgment, thinking over all I have seen and know of my fellow-countrymen, Great Britain as a nation, at no time to which my recollection goes back, has ever intended or wished to have war with Germany, and only the shock of the outrage on Belgium could have opened our eyes to the broader reasons for war that were within the knowledge of statesmen. Now that our eyes are open, the Germans, in the vulgar phrase, will have to "go through with it," for quite apart from our consciousness of the justice and necessity of our cause, and of the horror and desolation of war, Great Britain, now that it has come, seems rather to like war with Germany.



EVOLUTION AND THE WAR

CHAPTER I

WAR AND THE STRUGGLE FOR EXISTENCE

SOLOMON the King, admonishing the sluggard, bade him go to the ant and learn wisdom from her ways, and analogies between human conduct and the behaviour of animals are familiar in all literature. Such zoological images have lent a charm to homily and have smoothed the rough path of philosophical argument. They have adorned many a tale and have pointed many a moral. But now they come to us with a new authority. Since Charles Darwin convinced the world that man came into existence by descent from lower animals, zoological analogies are presented to us not as literature but as scientific fact. The augurs of imperial Rome advised on grave matters of state after inspecting the entrails of animals or marking the flight of birds. Modern philosophers explain and justify human conduct after a visit to the monkey-house at the Zoological Gardens, or from observations on the family life of rabbits.

Indeed, no result of modern science is so alluring as the doctrine of the continuity of all life, the conception of the ascent, under natural laws, of a

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primitive slime, on the one hand through sea-weeds and mosses and ferns to tall trees and lovely flowers, on the other, through worms and creeping things of the sea to the alert and bright-eyed creatures of the land, to antic apes and grave man. Few of us who have written or spoken on the science we love so well have not made at some time or another the facile transition from analogy to argument, and writers who deal with more pretentious affairs exude what they assume to be Darwinism.

The most notable instance of a zoological analogy that has been presented as a deduction from scientific law is the biological justification of war. I propose to examine the case as it has been presented by Germany, not because I covet the easy task of proving the enemy of my country to be in the wrong. The theory underlies much that has been thought and written on war in many countries, but it has seized the imagination of the German nation, consciously rejoicing in the splendour of material progress, and it appears to have contributed in no small measure to the catastrophe which is devastating civilization. Having stated the German theory as sympathetically as I can, I shall subject the zoological analogy to close scrutiny.

I propose to refrain from indignation at the results of German error; the pragmatistical doctrine that judges of the truth of a theory by its results, demands a moral complacency perhaps more common in Boston than in England. The shameful cruelty that has devastated Belgium is no more a proof of German error than is the splendid heroism of a unanimous nation a proof of German truth. In the long history

of mankind there has been no cause so great as to compel all its protagonists to honour, and no cause so wanton and vainglorious that men have not died for it. Human nature is better and worse than a philosophical theory.

Nor shall I be distracted by meditation on the glorious results that the Germans expect to flow from the establishment of a *pax Germanica* over the greater part of the world—German civilization reigning from the Urals to the Atlantic, from the North Cape to the Mediterranean, the docile millions of Asia practising the goose-step, and happy Africa playing Wagner and Strauss, syncopated for the tom-tom. Great objects these, but a prospective criminal very often intends to devote the proceeds of his crime to ennobling the human race. This branch of mental pathology has been amply illustrated by such barbarians as the English William Shakespeare (in *Richard III*), and by the Russians Tolstoi and Dostoevsky. But, although it requires no further comment, Maximilian Harden's recent statement is worth preserving: "And never was there a war more just, never one the result of which could bring such happiness as must this, even to the conquered."

Now let us turn to the German case. General von Bernhardi, in his popular book, *England as Germany's Vassal*, presents it most definitely. "Wherever we look in nature," he writes, "we find that war is a fundamental law of development. This great verity, which has been recognized in past ages, has been convincingly demonstrated in modern times by Charles Darwin. He proved that nature

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is ruled by an unceasing struggle for existence, by the right of the stronger, and that this struggle in its apparent cruelty brings about a selection eliminating the weak and the unwholesome." The existing disposition of the animal kingdom has come about by a process of evolution and descent. There is one critical and recurring phase in the drama of evolution. Some zoological unit, a family, race, variety or species, may have been struggling on tolerably equal terms for countless generations, now securing, now losing a little advantage, when the maturing of an innate or acquired quality, or a turn in the kaleidoscope of the world, upsets the equilibrium. The favoured unit increases in numbers, overruns its old limits, and comes into fierce competition with its neighbours. It has now to justify its innate or acquired advantage, to make good its new place in the sun, and there is only one mode in which this may be accomplished. In von Bernhardt's words, "The natural law to which all the laws of nature can be reduced, is the law of struggle." "From the first beginning of life war has been the basis of all healthy development. Struggle is not merely the destructive, but the life-giving principle. The law of the stronger holds good everywhere. Those forms survive which are able to secure for themselves the most favourable conditions of life. The weaker succumb." I need not multiply quotations that are now familiar. The doctrine, in short, is that organisms rise to higher things not on the stepping-stones of their dead selves, but on the dead bodies of all that come in their way.

The German nation is a biological unit at this

critical stage of its evolution. It is distinguished by a quality that makes it superior to all the other nations of the earth, a quality not easy to define, but perfected by long generations of patient culture, and tinged with the alluring mysticism of a mission. It has prospered beyond all belief in the splendours of material civilization, in commerce, in the arts and sciences. On every frontier it presses on the effete and barbarous peoples beyond its pale, and transcending the seas, it has infiltrated the remotest parts of the earth. Outside her own boundaries, however, Germany loses directive control over her own sons, and although these may look back to the fatherland with affection and gratitude, they submit to other influences and contribute to foreign prosperity. Becoming easy cosmopolitans, they forget the high purpose of nationality, and their children are citizens of new countries. Germany, in fact, is giving to all mankind what was meant for herself.

But in forty years of peace, the rulers of Germany have been mindful of biological law. Within a State, the rivalry of individuals and of groups may be controlled by the discipline of justice and law. In the struggle between State and State, there is nothing to mitigate biological law ; there is no right except might, no justice except the arbitrament of war. " Might is at once the supreme right, and the dispute as to what is right is to be decided by the arbitrament of war. War gives a biologically just decision, since its decisions rest on the very nature of things." And so they have bent the will of the people to the great task ; they have moulded all the activities of the nation into a machine for war, and high above the

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temples of the gods of peace, they have raised a shining altar to the god of war, the creator, the benefactor, the father of all. It may be that in the final struggles of German diplomacy there were hesitation, reluctance, and even uncertainty of purpose. But whether the actual moment were of German choice, or were forced on Germany, there can be no doubt but that Germany, alone among the combatant nations, went to war exultingly, conscious of fulfilling an expected destiny, entering on the completion of her national purpose, seeing in her conduct the very essence of the upward forces of evolution.

I hope that an examination of this reference of war to scientific law may serve the double purpose of arresting a dangerous mishandling of science and of clarifying ideas on some difficult biological problems.

We are all accustomed to speak rather vaguely about what we call scientific laws, and those who have least acquaintance with science appear to apply such laws with the greatest confidence. Law, with its implication of compulsory obedience, of control coming from without, is a misleading term in science. Those with more knowledge are careful to insist that a scientific law has no absolute validity, that it is empirical, a generalization from acquired experience. But it is something more, or perhaps I should say, something less than that. To use quite unphilosophical language, a scientific law is the result of the interplay of two factors, the extended world, at once the occasion and the subject of experience, and the human mind, ranging over the extended world,

codifying, simplifying, schematizing. The resulting law is of the human mind and in the human mind, rather than of the extended world or in the extended world. It is an attempt at comprehension, subjective and not objective. And when we take the scientific law, this human product, and attempt to fit it again to any part of the extended world, except precisely that part from which it was derived, we are apt to bump up against reality, and to receive an unpleasant if salutary shock. Reality! there is no more difficult word in any language, and I must explain in what sense I use it. In my own schema of the universe (and I am not going to pursue the irrelevant enquiry as to how far this is in harmony with the schemata of the high priests of philosophy) there is an ultimate, metaphysical reality which enfolds and permeates us. It is without qualities or conditions, relations, parts or magnitude, for all these are modes of human knowledge, the human garment with which we clothe the invisible, and all that we know of ultimate reality is that it is "not-us." About it we know nothing, for we can think and know only in terms of ourselves. We need not try to reason about it ; it is a mere statement of consciousness—there is no "us" unless there is "not-us." The fundamental paradox of metaphysics is that the moment part of reality enters into us and becomes known, it ceases to be real. The real presses into us through the avenues of our faculties, forming our knowledge of what we call the extended world, and in so doing acquires the human qualities, conditions, limitations that make it part of us. This immortal has put on mortality.

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The extended world is a filtrate of the real through our faculties ; it is the nearest to metaphysical or absolute reality that we can reach, and forms the practical reality of daily life, the chair that Dr. Johnson kicked to confute Berkeley. In all the further mental work that we do, arranging, systematizing, generalizing, making scientific laws and theories and hypotheses, the human faculties are more and more involved, and the results move further and further away, both from ultimate reality and from the reality of daily life. Man is recreating the universe in the categories of his own mind. Science is a salient instance of this transformation of reality.

We are all familiar with a practical side of the distinction between science and reality. An invention, to take an example, may be a correct and ingenious deduction from the laws of chemical combination and the physical properties of water, and may work very well in the laboratory. But the experienced capitalist, after due tribute to the inventor, is apt to say " quite pretty, but we must now try it on a little larger scale and under manufacturing conditions." Then the difficulties begin. For water in nature is not to be found in clean stoppered bottles, convenient to handle, but as rivers and streams, as seas and lakes, subject to rising and falling, to evaporation and freezing. And in the whole world outside the laboratory there is probably not a single drop of pure water, but hard water and soft water, bubbling water and flat water, water with varying mineral impurities and with organisms that breed and multiply and die. The

laboratory experiment has come in conflict with reality and may have to be abandoned.

The method of deduction takes us away from reality, and Darwin understood well the danger in its use. In a letter to A. R. Wallace (August 28th, 1872), he wrote: "I am not convinced, partly, I think, owing to the deductive cast of much of his reasoning; and I do not know why, but I never feel convinced by deduction, even in the case of H. Spencer's writings." In subjects that can be treated experimentally, deduction is an invaluable discipline. The experimenter is able to say "that being so, this other must follow," and if, on trial, this other does in fact follow, not only does the major proposition receive confirmation, but a direct addition to knowledge has been made. A pitfall gapes widely when the deduction cannot be subjected to experiment, for we are too readily disposed to say "that being so, this other must follow, and as it must follow, it is true." The moment we try to divert a proposition from the exact set of facts out of which it was derived, and to apply it to any other set of facts whatsoever, we are in imminent danger of foisting on ourselves and on others an analogy as a truth, and the glamour of apparent certainty that comes from the word science makes our fall only more disastrous. Of all the philosophers, Immanuel Kant (by descent a Scot) put the antinomy between science and reality in the sharpest fashion. All science, all experience, all scientific laws, he referred to what he called the theoretical reason, and regarded as the reaction of the human mind to the external world. All morality, all that relates to the

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conduct of man, he put in the category of the practical reason and regarded as being under the dictate of some authority that had no relation to experience. For the moment I am not concerned with the exact point at which Kant drew the line between theoretical and practical reason, or still less with acceptance or rejection of the Kantian sanction for morality. But I am concerned to remind you that one of the greatest of the philosophers, one who set out on his examination of human reason from the side of physical science, in the first place regarded all science as theoretical, and in the second place looked to a source other than science for the rules of conduct. It is grim irony, that would have pleased Heine, to find General von Bernhardt on the one hand proclaiming Kant as the chief glory of German idealism, and on the other not only treating a scientific law as part of the world of reality, but by applying it to a question of moral conduct, confusing between the theoretical and the practical reason, and so committing the *crimen non inter Kantianos nominandum*.

I am anticipating ; my argument has gone no further than to assert that a scientific law, being only a synthesis in the human mind of certain portions of what we call the extended world, has no necessary validity beyond these portions. When I have examined more closely the claim of the struggle for existence to be termed a scientific law, it will be time to enquire if the affairs of animals and plants, of which the struggle for existence is an alleged synthesis, are of the same order as those affairs of men and nations to which the Germans have applied it.

Is the struggle for existence, in the sense of war, or indeed in any sense, a scientific law? Let us turn to the history of zoological science. The idea that all the varied structures in the world, the divergent forms of metals and minerals, of trees and herbs and all the animal host that peoples the earth and the air and the waters, that all these had arisen from a primitive unformed material was known to the Greeks and Romans long before the story of creation in the Old Testament was accepted as an authoritative account. After many centuries, during which scientific thought was stifled by theological dogmatism, the theory of evolution, notably in its application to the species of animals, began to reappear. Buffon, and Erasmus Darwin, the grandfather of Charles Darwin, had stated in the clearest way the possibility that species had not been created independently, but had arisen from other species. Lamarck had worked out a doctrine of descent in full detail and had regarded it as the foundation of the science of biology. Herbert Spencer, writing in 1852, six years before the famous session of the Linnæan Society to which Charles Darwin and A. R. Wallace simultaneously communicated the outlines of their theories, had strenuously insisted on the evolution of organic forms. Huxley himself, on the anatomical side, had been working gradually towards a conception of the world of life past and present, as a single family tree growing up from the simplest possible roots and gradually dividing first into two main stems, the vegetable and animal kingdoms, and then into the endless series of ramifications represented by living animals and plants. He had been

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learning to trace whole branches, as yet separate at their lower ends, but in themselves shapely and showing a general resemblance to one another in their progress from simple to complex. In his voyage on the *Rattlesnake* he began to study jelly-fish, probably chiefly because these were abundant in the tropical seas. He made many dissections and drawings, but instead of following the example of his predecessors and contenting himself with stating matters of detail concerning particular genera and species, he tried to give "a broad and general view of the whole class, considered as organized upon a given type," and to enquire into its relations with other classes. Having in this way arrived at a conception of the peculiar organization of the group, he hunted through the numberless fragile and flower-like polyps of the sea and of fresh water, picked out from them all those that revealed structure of the medusa-type, and associated them in the great division that we know now as Cœlentera. He went even further, and making use of von Baer's conception that the younger stages of animals were more alike than the later stages, he showed that there was an essential similarity between the structure of Cœlentera and a stage passed through in the embryonic history of vertebrate animals. By like methods and with the same purpose, he brought together the hitherto scattered creatures that we now know respectively as Mollusca and as Ascidiæ, and traced the unity of organization underlying the progressive modifications of each group. And, finally, in his lectures on cells and protoplasm, he showed that animals and plants were composed of similar

living material, displayed the elementary functions of life in the same fashion, and were creatures of the same order.

Thus, in the middle of last century, the conception of evolution was much more than in the air ; it was definitely inspiring zoological thought both on its technical and on its philosophical sides. But there are two points about the position worthy of special attention. First, the infiltrating idea of evolution was extremely general in its character, and if Huxley or any of his associates who were technical zoologists, had been interrogated as to their views on the fixity of species, most certainly they would not have declared themselves with any confidence on one side or the other. The second point is that the pre-Darwinian conception of evolution, whether it were half unconsciously held as by Huxley, or consciously urged as by Herbert Spencer (and earlier by Buffon and Lamarck), was that of a calm and orderly process, a patient growth, the unfolding, so to say, of an inevitable plan, and not in the least as any kind of turbulent struggle, or of warfare between individual and individual, between species and species. I think it a fair assumption, that if Darwin and Wallace had not lived, this conception of evolution would have taken its due place in biology long before the present day.

Then, in 1859, there came the publication of *The Origin of Species*, and whatever might have happened otherwise, we know as a historical fact that the world came to its actual belief in organic evolution through Darwin. Huxley and his contemporaries were more than prepared to accept evolution,

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but it was not until Darwin's theory of natural selection provided a reasonable explanation as to how evolution might have come about, that they actually did accept it, and, turning to the stores of fact that were already within their knowledge, arranged the evidence that had been lurking unseen. Darwin brought forward, in favour of the occurrence of evolution, a body of evidence better arranged and more convincing than had ever been presented before, but, in Huxley's own words, it was "the theory of natural selection that was the actual flash of light," the illuminating idea that at once made evolution credible and encouraged others to search for evidence in support of it. Hence it came about that the word "Darwinism" was applied both to evolution and to natural selection. The vast body of work that has been accomplished since 1859 under the influence and stimulus of Darwin has convinced us of the fact of organic evolution. Evolution has been accepted as scientific law, as the mode of organic progress, and because the acceptation came through Darwin and through Darwin's natural selection, evolution and natural selection are confused as Darwinism, and the dignity of scientific law is extended from evolution to natural selection.

It was not the opinion of Huxley that natural selection was a scientific law, and Huxley was Darwin's chief defender and the most ardent protagonist of evolution. No man was more fully in Darwin's confidence, and no man played a greater part in the triumph of Darwinism. And yet from 1859 to the end of his life, he was consistent in regarding natural selection as no more than an illuminating and

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admirable hypothesis. Take a quotation from one of his essays, printed in *The Westminster Review* in 1860 :

“ Is it satisfactorily proved in fact that species may be originated by selection ? That there is such a thing as natural selection ? That none of the phenomena exhibited by species are inconsistent with the origin of species in this way ? If these questions can be answered in the affirmative, Mr. Darwin’s view steps out of the rank of hypotheses into that of proved theories ; but so long as the evidence at present adduced falls short of enforcing that affirmation, so long, to our minds, must the new doctrine be content to remain among the former—an extremely valuable, and in the highest degree probable doctrine ; indeed the only extant hypothesis which is worth anything in a scientific point of view ; but still a hypothesis, and not yet a theory of species.”—

“ After much consideration, and assuredly with no bias against Mr. Darwin’s views, it is our clear conviction that, as the evidence stands, it is not absolutely proven that a group of animals having all the characters exhibited by species in nature, has ever been originated by natural selection.” Now take a second quotation, from Huxley’s address to the Royal Society in 1894, when he was awarded the Darwin Medal :

“ I am as convinced now as I was thirty-four years ago, that the theory propounded by Mr. Darwin, I mean that which he propounded, not that which has been reported to be his by too many ill-instructed, both friends and foes, has never been shown to be inconsistent with any positive observations, and still

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holds the field as the only hypothesis at present before us which has a sound scientific foundation.—But I do not know, I do not think anyone knows, whether the particular view he held will be hereafter fortified by the experience of the ages which come after us.—Whether the particular form in which he has now put before us the Darwinian doctrines may be such as to be destined to survive or not, is more, I venture to think, than anybody is capable at the present moment of saying.”

I am sure that no one is yet in a position to be more certain than Huxley. All who are acquainted with the course of biological speculation know well that from 1859 to 1893, and still more from 1893 to the present time, the principle of natural selection has been subjected to the acutest debate. We can see for ourselves that the artificial selection of breeders and horticulturists has produced changes in form and structure at least as great as the differences that distinguish natural species of animals and plants. But we do not know that these changes would be permanent if the watchful care of the breeder were removed, or that the new forms could hold their own and persist in a natural environment. The opportunity for natural selection comes about because of the existence of variation, because of the observed fact that individuals of the same parentage are not identical but present innumerable differences from one another and from their parents. These differences may be minute, and perceptible only on skilled measurement, or they may be of a magnitude that attracts even the careless eye, ranging up to what we call sports and abnormalities. When a

large number of individuals has been examined with regard to any particular organ, structure, or character, the observed variations may form a continuous series, that is to say, practically every intermediate degree of magnitude from the smallest to the greatest that occurs may be found ; or the series may be discontinuous, that is to say, there may be large gaps between any two variations of the series. I have been using the convenient term magnitude, but the variations concern not only characters that can be measured by weight and length, but those distinguished by chemical differences revealing themselves in colour and function. In the easy case of colour, the continuous series may appear as a steady passage across the chromatic scale, one tint passing imperceptibly into the next ; the discontinuous series as a set of distinct colours. Finally, the observed variations may be scattered evenly round a central point, as if they were what we should be disposed to call chance fluctuations, or they may be oriented in a definite direction, as if the constitution of the creature were obeying a guiding impulse. A. R. Wallace believed that the small, continuous, and unoriented variations were the material of natural selection. Darwin differed in his opinion at various times in his long career, but on the whole was inclined to the view that Wallace urged. Since the death of Darwin a very large amount of work has been carried out in the analysis of variations, and methods have been devised by which it has been possible to conduct experimental enquiry into the behaviour of characters in inheritance on a scale and with an exactness that have

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almost transformed the study of inheritance into an experimental science. The most active investigators in this field received their initial stimulus from the rediscovered and now well-known researches of Mendel, a forgotten contemporary of Darwin. This active and brilliant school urges more and more strongly that most of the minute, continuous variations or fluctuations, on which Wallace and Darwin laid stress, are ephemeral effects of the environment, are not transmitted to the next generation, are not summed up in the course of generations, and so play no part in the origin of species. They believe, on the other hand, that new species and new characters come into existence by the appearance of sudden variations, usually large and discontinuous, and that these are not ephemeral, do not require summation, but may be transmitted in full vigour to the offspring of the individual in which they first appear. They have succeeded in producing and fixing strains of animals and plants marked by definite characters, with a certainty that recalls the operations of a synthetic chemist rather than the empirical efforts of a breeder. It would seem as if they had added to the probability of natural selection by showing the existence of variations larger in magnitude and more certain of inheritance than the minute fluctuating variations of Darwin and Wallace. At the most, however, this Mendelian view does nothing to prove the existence of natural selection, but suggests that, if it does exist, the elaboration of new characters and the separation of new species might be much more rapid. And it is to be noted that many of the most ardent Mendelians have such confidence in their own

theory that they no longer think it necessary to invoke the operation of natural selection at all. Yet another school of zoological inquiry, consisting for the most part of those who devote themselves to examination of the fossil records of life, attaches increasing importance to the existence of variations oriented in some direction, and think that the evidence points to the branches of the tree of life having been thrust in their diverging courses by some inward directive force, instead of having been trained and lopped by selection.

It happens to be my own opinion that these various views can be synthesized under the Darwinian principle, and that natural selection still holds the field as the most credible hypothesis of the cause of organic evolution. Nevertheless, in the last sixty years, many distinguished biologists have seen in natural selection the only probable agent in effecting evolution, an agent competent to account for all the changes that we know to have taken place; others have held that its probable influence has been overrated; others that it has been only one of the many causes of organic evolution; others again have doubted or denied its efficacy. The scientific world is agreed about evolution; it is not agreed about natural selection. It is merely ludicrous to assert that natural selection and the struggle for existence have any claims to be regarded as scientific law. The German claim that "the natural law to which all the laws of nature can be reduced, is the law of struggle" fails, first because, even if it were a scientific law, it does not follow that a law derived from a consideration of animals and

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plants applies to human beings, and second, because it does not happen to be a law, but a hypothesis much in debate.

CHAPTER II

THE STRUGGLE FOR EXISTENCE AMONGST ANIMALS

I HAVE already stated that pre-Darwinian writers thought of evolution as a process of calm and orderly unfolding, a placid growth of the tree of life under the benignant reign of natural law. It was in such a sense that Darwin presented his theory of evolution and his doctrine of the struggle for life. The sub-title of the *Origin of Species* was the "Preservation of Favoured Races in the Struggle for Life." By "favoured races" Darwin meant not in the least those that were best armed for the active extermination of their fellows, but those that were best suited to their whole environment, including climate, food-supply, chances of mating and leaving offspring, general adaptation to their place in the composite web of life. In the first edition of the *Origin* (p. 62) he wrote: "I should premise that I use the term struggle for existence in a large and metaphorical sense, including the dependence of one being on another."

It was in such a sense that the struggle for existence commended itself to Hooker, one of its first

converts, to whom, as a botanist, the conception of a set of plants actively exterminating another would have been only ludicrous, and to Lyell, the geologist, who had devoted his life to refuting the catastrophic theory of the past history of the earth, and to replacing it by a theory of slow and uniformitarian change. In the vast clamour of invective and abuse with which Darwin's work was assailed, every weapon that fear could barb or malice could poison was employed. I cannot conceive but that if the struggle for existence had been presented by Darwin, or received by his contemporary opponents, in any sense corresponding with the German view, the point would have been taken eagerly and denounced with all the vigour of outraged morality. But it was not so. The attacks were directed against the dethroning of the Book of Genesis, the descent of man from apes, what Carlyle called the "monkey damnification of mankind," the replacement of design by adaptation, the inferred removal from the world of life of the immediate interference of Providence. It was only later, when poets and popular writers got to work, that the struggle for existence acquired the special significance of fierceness and cruelty, became an expression of nature, "red in tooth and claw."

We get still further away from the German conception of war between nations as an example of the struggle for existence when we approach the facts of nature more closely. Sir Ray Lankester, so far as I remember, in a criticism of M. Paul Bourget's *Divorce*, has already called attention to a common misunderstanding of the hypothesis. One species is

not supposed to advance in serried ranks against another, wolves against bears, eagles against vultures, firs against beeches and so forth. The competition is internal, amongst the individuals of a species. Darwin applied the Malthusian law of population to the animal and vegetable kingdoms generally. All organisms tend to multiply at a rate that would rapidly outstrip the food-supply. It is easy to realize the effect of unchecked multiplication in the case of organisms that give rise to immense numbers of young every year. A turbot, for instance, can produce as many as fifteen millions of eggs in a season, so that if all the descendants of a single pair of turbot were to survive, the huge area of the oceans would be filled with a solid mass of fishes. Darwin's famous calculation about elephants, which are extremely slow breeders, showed that at the end of the fifth century, if all the descendants survived to the full term of their life, the living progeny of a single pair would number over fifteen millions. In my book on *The Childhood of Animals*, I suggested that the difference between the effective multiplication of organisms producing a very large number of young and of organisms producing a small number tends to be obliterated, from the circumstance that in the first case there is a heavy destruction of the helpless young, and in the second case the smaller families usually receive useful parental assistance and protection. With small families as with great, however, the total result is that too many young are produced, and there is an active competition among the young and among the adults not only for food, but for other necessary conditions of life,

such as air and water, sunlight or shadow, house-room and playground. According to Darwin, the result of these circumstances is that on the average the individuals better adapted to secure their necessary share of these conditions of life survive longer, and leave more progeny, than their less fortunate relatives.

No doubt the total effect of this internal struggle amongst the individuals composing a species may be to raise the general level of the species' capacity and to permit one species to encroach on the ground of another. It is astonishing, however, how little we actually know of the influences that have been at work when one species has replaced another or has encroached on its territory. My friend and colleague, Mr. R. I. Pocock, who has made a special study of the wild dogs, jackals and foxes that occur in various parts of the world, has reminded me of the case of the Tasmanian wolf and the Australian wild dog or dingo. The thylacine, or Tasmanian wolf, is the fiercest of the marsupials or pouched mammals that form the characteristic members of the fauna of Australia. It is about the size of a large fox, brown in colour with dark stripes, and is active and predacious. It is now limited to the island of Tasmania, and indeed to the remote and mountainous parts of that country, as its depredations on lambs and poultry have made the settlers very unfriendly to it. Formerly it was abundant on the mainland of Australia, and teeth and skulls, belonging either to the Tasmanian thylacine or to a closely allied species, have been found in Queensland and New South Wales, not only in the recent river gravels, cave

earths and lacustrine deposits classed as pleistocene, but also in the older pliocene beds at the top of the true tertiary period. The marsupials represent a lower grade of mammalian life, and, in the security of Australia, of which they were in undisturbed possession, they broke up into herbivorous, frugivorous and carnivorous forms, in a fashion parallel with the similar breaking up of the higher types of mammals in other parts of the world. The thylacine was the most powerful carnivore that came out of the marsupial stock, and it acquired the habits and much of the appearance of true dogs and wolves.

In Australia there is no longer a thylacine, and its place in nature is occupied by a true dog, the dingo, a medium-sized, prick-eared, brown animal very like the pariah dog of India. It was the only large non-marsupial mammal present in Australia before the arrival of white man. Certainly it is a much more recent arrival than the thylacine; its remains have been found in the pleistocene gravels, but most authorities are agreed that it arrived in Australia by human agency, in a semi-domesticated condition, coming with the Asiatic human stock that first reached Australia creeping from island to island along the Malay Archipelago. However the dingo may have come, there seems here to be a case of one predacious animal replacing another and occupying its territory, for the thylacine has disappeared from Australia and survives only in Tasmania, which has not been reached by the dingo. But how did the replacement actually take place? The dingo is certainly of a higher type than the thylacine; it

has a larger brain and a robuster constitution, and is almost as adaptable and intelligent as the common domestic dog. It thrives in captivity, and becomes tame and friendly. The thylacine, like many creatures of low intelligence, remains fierce and shy in captivity, hardly learns to distinguish between its keepers and casual visitors, and is much more liable to disease. There is no particle of evidence that the dingo made any direct attack on the thylacine. If a struggle for existence did take place between the two animals, it was a struggle in which we must suppose the energies of each to have been directed against the environment common to both, rather than directly against each other. Each sought food of a similar kind, each had to resist the inequalities of climate, to find water, to produce and to rear young. What the deciding factor was, is impossible to say. It may have been a question of resistance to disease. Marsupials in captivity, and probably in nature, are subject to the attack of a parasitic fungus producing in their tissues a very fatal disease known as mycosis, a disease that happens to be much more common among birds than among mammals. This disease is practically unknown among dogs and wolves, but it has killed at least one of the few thylacines we have possessed at the Zoological Gardens.

Although we do not know, we can at least infer that the struggle in which the thylacines perished in Australia and the dingo succeeded, was one in which success came to the hardier, larger-brained and more adaptable, rather than to the better armed and more aggressive creature. A struggle, in fact, much more

like what occurs between rival nations in time of peace, than between rival nations in time of war. Even if we accept the German notion, that they are a more highly endowed, more intelligent, more industrious and more highly civilized people than the French or English or Russians, the zoological analogy which seems most pertinent could be found for their peaceful infiltration of Russia and France, of England and the English Colonies, an infiltration that has been rudely arrested by the operations of war.

Since Darwin referred to the case of rats, in his chapter on the struggle for existence, an elaborate and very definite story has got into literature. Darwin remarked "How often do we hear of one species of rat taking the place of another species under the most different climates." The story which has passed into almost universal acceptance is much as follows. Great Britain used to be occupied by a native rat, the black rat, a relatively gentle and timid creature. As a collateral proof of the disposition of the black rat, it is stated in many text-books on zoology that the white rat with pink eyes, often kept as a pet and known to be a gentle and friendly creature, is a descendant of the native black rat, an albino strain that has been artificially preserved by breeders. Then another rat, the brown or Norway rat, reached this country, probably by ships. It was a larger, bolder and fiercer creature. It quickly secured a foothold, attacked the black rat, drove it out of occupation, and so nearly exterminated it that only a few survivors have escaped destruction. It is generally added that a similar process is going on

in most parts of the world, the native black rats everywhere giving way to the Norway rat.

The truth is very different. There are two species of rat in this country. The species corresponding with the black rat of the popular story is known scientifically as *Mus rattus*. It is rather smaller and not so heavy as the Norway rat and can be distinguished superficially by its very large ears and very long tail, the tail always exceeding the body in length, and by certain characters of the teeth and skull. The fur is smooth and soft. There are at least two well-marked colour varieties, possibly distinct enough to rank as sub-species, one being very dark and corresponding with the common designation "black" rat, the other, almost golden-brown in hue, and known as the Alexandrine rat. *Mus rattus* is a better climber than the Norway rat and is the typical barn and granary rat. The Norway rat, known as *Mus decumanus*, attains a greater size and weight, is usually browner in colour with a harsher fur, and has the ears relatively smaller and the tail shorter than the length of the body. There is some confusion resulting from the fact that melanistic or nearly black varieties of the brown rat are quite common; these are often brought to the Zoological Gardens by persons who believe that they have obtained examples of the old native rat. *Mus decumanus* is the typical outdoor rat, the haunter of sewers and drains. Although both rats are almost omnivorous, the Norway rat is specially a scavenger, and the black rat specially a feeder on grain. The black rat is much more active; in the East it nests in trees, in the roofs of houses, in all sorts of inaccessible places.

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If one of them be set free in a room, it will be "all over the place" at once, climbing up the curtains, springing on bookshelves. A brown rat under the same conditions keeps to the floor, seeking some dark hole or retreat, for it is above all things a ground animal, a burrower.

There is certainly a difference in disposition, but this does not agree with the popular idea. *Mus rattus* is wild and shy and extremely difficult to tame. *Mus decumanus* quite readily becomes tame. The white rat is not an albino *Mus rattus*, as is usually stated, but the characters of its ears, tail, teeth and skull show that it belongs to the *decumanus* species, and this relationship has recently been confirmed by one of the most subtle tests of affinity, the form of the blood crystals.

Black rats and brown rats appear to have been originally natives of Asia, but the brown rat is the more northerly form, hardier and more adapted to live in fields and drains and the open air of northern Europe. Both species have extended their range through the agency of man. The black rat came here probably from Mediterranean ports, and finding suitable conditions, spread over Great Britain and Ireland, not only occupying ports and harbours and granaries, but taking to the open country for which it was less suitable. Records of it have been found in literature back to the sixth century, but it had not become notorious until the fourteenth century. The brown rat was a later arrival, probably beginning to come in numbers with the Baltic trade in the seventeenth and eighteenth centuries. It has rapidly spread over the country, and has become the

common field or outdoor rat, for which its hardy nature is better suited, and in such situations it is replacing the black rat. But so far from the black rat becoming extinct, it is increasing in numbers in many places, especially in ports such as London, and is still common in suitable localities all over Europe. In this story of the rats, which has been very carefully investigated, there is no trace of a process comparable with the German theory of war as an instance of the struggle for existence.

No doubt, and I understand from Sir James Crichton Browne that the experiment has actually been made, if a number of black and brown rats were shut up together in a cage, the brown rats, as the larger and heavier animals, might kill the others, but such a process has played little part in nature. Each species has its different aptitudes, capacities and preferences, and each insinuates itself into the most suitable environment. Possibly the extension of sewers and drains in this country has been a major cause of the greater success of the brown rat.

A third example, also referred to quite briefly by Darwin in his chapter on the Struggle for Life, that of the cockroaches, has passed into general literature in a misleading fashion. These active, repulsive and voracious insects are omnivorous feeders, devouring almost any animal or vegetable substance. There is no kind of human food from which they will refrain, whether it be raw or cooked, and they will eat paper, the paste from labels, the leather covers or bindings of books, and all kitchen refuse. They devour the bodies of other dead cockroaches, although I cannot ascertain that they will actually kill each other ;

recently in the insect-house in our Gardens, they seized some leaf-insects larger than themselves and devoured them alive. Within historical times, chiefly by the unwilling agency of man, different species of cockroach have extended their range very widely, and have come into competition with each other and with other insects. Is there anything resembling war in that struggle for existence in which cockroaches have been successful?

The native cockroaches of this country are small creatures, less than half an inch in length. They belong to the genus *Ectobia*, and the three or four species occur also in continental Europe. The best known is *Ectobia lapponica*, a hardy form, whose range extends farthest to the north. This species is said to devour the dried fish of the Laplanders and probably invades their huts. But in England and Europe generally the *Ectobia* cockroaches do not come indoors except by accident. They are found in the open country, in sandy heaths, under dry leaves in the woods, sometimes on trees, and frequently in that happy hunting-ground for insect life, the heaps of rotting sea-weed and débris along the high-water line of the shore.

The well-known house-cockroaches, the real pests, are all comparatively recent arrivals in Great Britain and are all specially addicted to the neighbourhood of man, never living habitually in the open, although in summer they sometimes invade gardens and eat buds and young shoots. The most common in this country is the oriental cockroach, *Periplaneta orientalis*, the usual domestic "blackbeetle," so-called according to a humorous remark because it is

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not black and is not a beetle. It attains the length of about an inch, and differs from the others in that the females cannot fly. It swarms in enormous numbers in the holds of ships, in basement kitchens, and in dirty and damp places. This insect is supposed to be a native of the far East and to have spread through Europe gradually. Gilbert White, writing in 1790, speaks of it as being an unusual insect at Selborne, adding "how long they have abounded in England I cannot say, but they have never been observed in my house until lately." It was common in London cellars so long ago as 1634, and no doubt took a good deal of time to get to an inland village like Selborne. The German cockroach, *Phyllodromia germanica*, is much smaller, reaching about two-thirds of an inch in length. It is paler in colour, winged in both sexes, and is much more active than any of the others, running quickly up vertical walls, on ceilings, and even on surfaces as smooth as glass. These little cockroaches swarm all over the rooms they infest at night, and when disturbed they will drop from the ceiling on the intruder's head. The German cockroach is believed to have been originally a native of the woods of central Europe, where it is still occasionally found, but it took to invading houses, especially bakehouses and breweries, and is now as much a domestic parasite as the others. They are common in London restaurants, and in many of the large blocks of flats, and have established themselves in several parts of England. They are extremely tenacious of life and will survive even prolonged immersion in water. In the United States, where the species is known as the Croton bug, because its first

appearance in great numbers was associated with the introduction of the Croton system of water-pipes in New York, it has become the most abundant, establishing itself, probably because of its smaller size and more active habits, in preference to the oriental and the American cockroaches. The American cockroach, *Periplaneta americana*, is a reddish-brown creature, strong on the wing in both sexes, and attains a huge size—from an inch and a quarter to nearly two inches. It has been called the ship cockroach, as it is the insect most often seen by passengers, and although originally a native of tropical or South America, it has spread over the world probably with trade, and has established itself in a good many towns in this country, chiefly in warehouses. A closely allied species, *P. australasiæ*, not quite so long, although rather wider, and more brightly coloured, has now acclimatized itself chiefly in greenhouses in many parts of England. One or two other exotic cockroaches occasionally appear in England, and a green one, which comes with bananas, has been reported from houses in South Kensington.

In the Zoological Gardens the Oriental, the German, and the American cockroach have all been thoroughly established for years. The large American cockroach infests the Reptile-house, the German species the Small Bird-house and the Ape-house, and the oriental insect is specially addicted to the Small Mammals'-house and the keepers' rooms. I can find no evidence that the members of the different species attack one another, but they are very rarely found in actual association. Obviously they find in their respective haunts conditions that suit them well,

but even under conditions with which I am so familiar as those in the Gardens here, I cannot be certain what are the causes of the preferences. Still less is it possible to guess why *orientalis* should have spread from the far east and have become quite common in Germany although there was already a cockroach in possession ; why it should be most abundant in England, and reaching America, be common, although less abundant there ; or why the German cockroach should establish itself in England, on the whole less successfully than the oriental form, and yet on reaching America become the most abundant there. Still less can we guess why cockroaches should on the whole have displaced the domestic cricket. But at the least we can be certain that in this comparatively recent and well-observed set of changes in the distribution of species, there is nothing even remotely comparable with the interpretation of the struggle for existence as war.

It is unnecessary to multiply instances. The causes of the success of one or another species in the struggle for life cannot be associated with any circumstances that suggest the active violence of the members of the successful species directed against the members of the less successful species. Recently I have been reading a patient and exact study of nature of a kind that would have delighted Darwin. Dr. Victor Shelford, of the Department of Zoology in the University of Chicago, with a number of assistants, has been engaged for years in making a complete survey of all the animals, large and small, that live in a limited area near Chicago, and has published his results in a volume under the title *Animal*

Communities in Temperate America (The University of Chicago Press, Chicago, 1913). He has tried to obtain a picture of a small portion of the web of life, a picture which would show the relations of animals to one another, to plants and to physical environment, to see the struggle for life as it exists, to appreciate the conditions of failure and success. He is no sentimentalist. He expects to find nature "cruel and heartless"; he admits that "to die to become the food of another organism is the fate of the vast majority of animals." The general nature of his conclusions is shown by his title. The animals of any given region form what he calls animal communities, each community consisting of a number of species that have selected a particular environmental complex. The selection of the habitat comes about partly by a method of trial and error, which is instinctive rather than conscious, and partly by the adjustment of behaviour to the conditions, such adjustment again being probably unconscious. The different groups from stream, pond, lake, prairie, thicket and forest communities, and their relations to one another and to the environment, to relatively stable conditions and to changing conditions, have been carefully analysed and show the most finely balanced system of interdependence and unconscious co-operation. Natural suitability to the organic and inorganic environment and capacity to adapt behaviour to circumstances are the dominant factors in successful struggle, and there is no trace of the remotest resemblance with human warfare. This is the struggle for existence as Darwin thought of it. In Darwin's own words, when one species is more successful than

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another and encroaches on its ground " we feel sure that the cause lies as much in one species being favoured as in another being hurt." Natural selection comes about by " the preservation of favoured races " rather than by the extermination of one race by another.

A curious case of the struggle for existence between species apart in systems of classification, is found in the relation between parasites and their hosts. Protozoa, round worms, thread worms, flat worms and flukes, and many kinds of insects and arachnids, infest the bodies of vertebrate animals as internal or external parasites. We know that serious damage may be done to individuals and species by such parasites, either directly by injuring the tissues or blocking the blood-vessels, or in a more insidious way by conveying to them the seeds of disease. Here we might expect to find a salient example of the ruthless stress of the struggle for existence between species. None the less there are limits to the severity even of this infliction. My friend Professor Minchin has shown that it can seldom or never be to the advantage of a parasite to kill its host. When a parasite is fatal to its host, as in the case of the trypanosomes that cause one of the forms of sleeping sickness in Africa, he infers that the parasite is a recent intruder. Parasite and host have each to be modified to accommodate one another, and, unless both are to perish, the result of the struggle for life that each makes, is that in course of time the parasite becomes transformed into a relatively or absolutely harmless messmate.

Sir Ray Lankester has suggested to me that possibly a closer analogy could be drawn between nations and communities of social insects than between nations and species. Doubtless when we reflect on the elaborate ordering of a community of ants, of the care devoted to the young, of the capture of other ants to serve as slaves, of the domestication of plant-lice and their use as milch-cows, of the cultivation of fungi to be used as food, it is plain that the animal kingdom presents nothing comparable until we reach the highest organizations of civilized man. But they all differ in one notable aspect from nations. The communities of ants and bees, wasps and termites, are in reality families, in most cases the progeny of a single pair. The colonies of wasps and bees are annual, those of termites and ants last a number of years. Among the termites certain individuals, both male and female, are so much modified that they cannot perform the duties of normal individuals but act only as soldiers for the defence of the community, or as workers. Among wasps and bees there are no soldiers, but the sexual development of a large number of the females is arrested, and these become workers for the whole community. The pointed instrument at the tip of the abdomen, which was originally an ovipositor, an apparatus used in placing the eggs in suitable places, has been transformed into a painful weapon of protection. In the case of ants, also, there are females modified to serve as soldiers and workers.

Certainly these remarkable social insects defend their homes at the cost of their lives, sally forth on

foraging expeditions, singly or in vast companies, and return with stores of food and plunder. Their habits and customs have been described with a wealth of picturesque language and an attribution of human motive excessive even for writers on natural history, and I suspect that much new observation and careful interpretation are required before we can really understand what is going on. But taking the picturesque descriptions even at their face value, it is certain that in the case of bees, wasps and termites, although there may be fighting, either individual or in companies, in defence of the hive or nest against either intruders of the same kind or alien enemies, and although there may be occasional raids for food on the nests and hives of others, there is nothing in the form of direct warfare between one community and another. Ants belonging to many species are chiefly or wholly vegetarian, and although the march of foraging columns has been compared with the movements of armies, the operations are peaceful, and fighting is confined to defence. Carnivorous ants attack every creature, dead or alive, that comes in their way, and when in the tropics they overrun a house, every cockroach, spider, centipede, lizard, snake, rat or mouse that does not hurriedly escape, is seized and devoured. If fighting take place between one community of carnivorous ants and another, it seems to be an accidental issue of the general search for food, rather than a process in which one community is trying to prosper through the extermination of another, and I have not heard it even suggested that the stronger party retains possession of a nest that it has ravaged.

The slave-making instinct, which occurs in many species of ants, is the most curious phenomenon of insect-life. Doubtless it leads to the direct attack of a community of one species on a community of another species, with the result that the pupæ of the attacked nest are secured. The stolen pupæ are reared in the home of their capturers, and the captives feed and tend their masters. I hazard the suggestion that this instinct is no more than a perversion of the elaborate care exhibited by all species of ants to their own young. If the nest of any species be disturbed, so that the pupæ (the ants' eggs of commerce) are exposed, the ants at once lay hold of them and try to drag them off to a place of safety. I should think that ants would automatically treat the pupæ of any other nest in similar fashion. But however the slave-making habit may have arisen, such a violent manifestation of the struggle for existence has led to results which do not encourage intelligent human beings to imitate it. For the instinct has led to a progressive degeneration of the species in which it is found, and instead of being an advantage, may lead to extinction.

In comparing insects and men, we have to remember that the analogy is vitiated because of the extreme difference in mental constitution. Social insects represent what is probably the highest stage of the elaboration of instinctive action, man the highest stage that has been reached in the development of conscious, intelligent action. We may agree with Professor Bergson that unconscious instinct is closer to the heart of life, and that it is the highest expression of the vital force, or we may believe that

the replacement of instinct by conscious, responsible, intelligent, experimental action is the fine flower of evolution, but at least we must accept the distinction as fundamental and as obliterating any possibility of useful comparison.

The strength and ferocity so frequently displayed in the animal kingdom, the restless pursuit of their prey by hungry animals, the use of offensive weapons such as beak and claws, horns and teeth, are frequently used as analogies for the activities and weapons of human warfare. But the comparison does not bear close examination. The necessity of eating and the peril of being eaten are associated with much that is wonderful in the instincts and apparatus of the animal kingdom, with the development of courage and cunning, of alert senses, of muscle and bone, armour and weapons, eyes and ears and nose, touch and taste, colouration and form. But from the lower to the higher animals, there has been a gradual replacement of a general unintelligent ferocity, ready to grasp at everything, friend or foe, that seems a possible food, to a more specialized, more competent and at the same time more limited instinct that comes into action only at the necessary call of hunger, and only with regard to the normal prey. I suppose that the large carnivora, such as lions, tigers and bears, are the highest examples of ferocious animals. They, however, are not ferocious (apart from fear and sex) except when they are hungry. Apparent exceptions are old lions and tigers, and possibly a few species such as polar bears. But these, probably, are always hungry; they have few chances of getting food, the old animals because they

have lost much of their strength, the polar bears because they have to live on seals, creatures more active and intelligent than themselves, and so they cannot run the risk of losing any chance that comes their way.

Apart from the obtaining of food, the strength, ferocity and weapons of all the higher animals are employed only in defence of themselves, their mates or their young, or in the rivalries of sex, and even in the difficult conditions of captivity males can usually be kept together except in the breeding season. It is, moreover, too obvious a truth for elaboration that civilized man has developed fashions of obtaining food, more economic and successful than those involving the slaughter of his fellow-men.

Looking through the animal kingdom as a whole, and remembering that the vegetable kingdom is as much subject and responsive to whatsoever may be the law of organic evolution, I find no grounds for interpreting Darwin's "metaphorical phrase," the struggle for existence, in any sense that would make it a justification for war between nations. It is my business just now to refute a misconception of the struggle rather than to explain what it is. But, if the latter were my task, I could adduce from the writings of Darwin himself, and from those of later naturalists, a thousand instances taken from the animal kingdom in which success has come about by means analogous with the cultivation of all the peaceful arts, the raising of the intelligence, and the heightening of the emotions of love and pity.

CHAPTER III

NATIONALITY AND RACE

LET us accept, for the moment, the German assumption; although I have shown it to be erroneous, that the struggle for existence is the law of evolution. I have pointed out that a scientific law is a generalization from a particular set of data and that it is extremely misleading to apply it to any other set of data. I have now to ask if there be any congruity between the facts of zoology and botany from which the law of struggle for existence was derived and the facts of national existence to which it is proposed to apply it. The individuals of the animal and vegetable kingdoms can be grouped as families, genera, species, varieties and so forth. Human populations are grouped into different nationalities. The comparison that seems most obvious is between nations and the species of animals and plants. Nations, if not actually distinct species, may be varieties of the human race on the way to acquire specific distinction. They may be species in the making, incipient species. But there is no subtlety in the German analogy. The struggle for existence is supposed to have a universal application, and the particular zoo-

logical unit selected for comparison is of no moment.

All the zoological units with which nations have been compared have this in common, that they are of the same stock and are stamped with the same hereditary material. Blood relationship is rooted in the central idea of evolution. What binds together the members of a species, sub-species, variety or race, is the link of common descent. Individuals are born, struggle, reproduce and die that the species may flourish. Nature is careless of the single life, careful of the type, and it is possible for her to be lavish with individual lives, because the qualities of the type are preserved in all the members of the species. In discussions on evolution and natural selection, the conception of common descent is an implied major premiss. In anatomy and embryology our constant effort is to distinguish between homologies, resemblances due to the possession of a common hereditary material, and homoplasies, resemblances imposed on different hereditary material. In systematic zoology we are not satisfied with a classification unless it exclude resemblances among creatures that are not akin, and rely wholly on resemblances that are inherited from a common ancestor. On the theory of evolution the tree of life is a genealogical tree.

Now if we apply this conception of racial community to the nations of modern Europe, we shall find that it does not hold.

Apart from a few separate problems, such as the origin of the Jews, the Basques and the Lapps, the best zoological opinion distinguishes three distinct races or racial types amongst the white population

of modern Europe. The main physical characters by which these are identified relate to the skull, to the colouration and to the stature. The form of the skull is best measured, for racial purposes, by the cranial index, that is to say by the breadth of the skull taken above the insertion of the ears, stated as a percentage of the greatest length in the middle line measured from front to back. If a skull were as broad as it was long, the cranial index would be 100 ; if it were only half as broad as it was long, the cranial index would be 50. The extreme limits, among living races, are from about 62 to 103. Indices below 75 reveal themselves to the eye as long heads, and the cranial type is termed dolichocephalic. A head with a cranial index of about 70, such as might be seen in an extreme type from Scandinavia, or in an average Berber from Tunis, would appear very long indeed. Indices above 80 just begin to appear round and are known as brachycephalic. A head with an index of about 94, such as might be seen in a Lapp or in a French Savoyard, would appear very round indeed. My own head, which has a cranial index of about 81, is unusually broad for a native of Great Britain, but this would hardly be noticed except by a hatter who has to widen a stock size for me, just as he has to lengthen the same stock size for a colleague of mine whose cranial index is about 75. There is almost no reason to suspect that the cranial index is directly under the influence of the environment ; it appears to be an inherited racial character.

Investigation of the colouration of the human body shows that both the influence of the environment and racial inheritance are concerned. We see the

effects of climate on the skin during individual lives, especially in the white races, and we are accustomed to associate the dusky races with the action of the sun through long generations. A general survey of the population of the earth, however, shows that there is no correspondence between the lines of temperature and the colouration. The want of agreement is plain throughout the world, but is especially conspicuous in the indigenous peoples of North and South America where there is no relation between colouration and climate. Tropical Brazil, for instance, contains the lightest indigenous population of America, and a very dark race stretches down the Pacific Coast to the extreme south of Patagonia. In every part of the world, the Jews, under the influence of economic and political conditions, as well as from racial aptitude, have passed much of their lives indoors or in the narrow and sunless streets of cities, precisely under those conditions that we expect to find associated with paleness in individual lives, and yet the Jews, on the average, are always nearly thirty per cent. darker than the outdoor peoples amongst whom they live. The effects of tanning are not inherited, for the children of sailors are not darker than those of artisans of the same race. On the other hand, especially among white people, there is some connection between altitude and pigmentation; inhabitants of highlands and mountains are on the average blonder than their kinsmen of the plains.

The colour of the hair and eyes frequently changes with age, being lighter in young children than in adults, but it has been found impossible to correlate

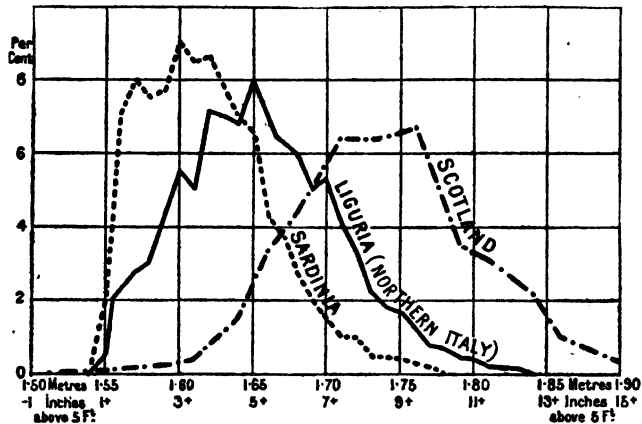
the pigmentation of hair and eyes with any factor in the environment, so that these appear to give more valuable information regarding race than can be derived from the general pigmentation of the body. Taking brunet traits as a whole, including those of the skin, eyes and hair, race is dominant over environment, and although the indications are not so clear as in the case of cranial indices, they are valuable. Stature, like colouration, is affected by race and by environment. Rather more than ninety-nine per cent. of the human species exceed five feet one inch in height, and if we leave out of consideration a few races and individuals that are abnormally tall or abnormally short, the total range of variation in stature does not exceed nine or ten inches. The environment, and especially the conditions of nutrition, affect the stature in individual lives. Bushmen and Hottentots belong to a naturally short race, but the Bushmen of the Kalahari Desert, where the conditions of life are extremely severe, and where semi-starvation is almost the normal condition, are very much smaller than the Hottentots who inhabit a more fertile area and who own flocks and herds. The pigmies of the head-waters of the Congo have probably been dwarfed by the extreme hardships of their life. The natives of Tierra del Fuego and the Patagonians of the mainland are members of a naturally tall race. The former, living under conditions of inclement weather and scarcity of food almost impossible for human beings, are much less tall than the Patagonians who have not to undergo great hardship. In many parts of Europe, as for instance in the hills between Limoges and Perigueux, there are

local areas of extreme poverty. The soil is unkindly and the climate harsh, and chesnuts form the staple diet. The natives of these regions average inches less in height than their neighbours, and the percentage of the young men who fail to come up to the army standard in height and girth is abnormally large. The slums of great towns show similar results.

The influence of environment is most acute on children. The Anthropological Committee of the British Association long ago showed the beneficent effect of the Factory Acts, which rescued young children from the hardships of daily toil. Boys of nine years in 1873 had a height and weight equivalent to the height and weight of boys of ten years old in 1833. The direct effects of the environment, however, appear to escape inheritance, for children removed from conditions inducing low stature, to more favourable conditions, attain normal height if the change has been made sufficiently soon. Children of normal parentage placed in unfavourable surroundings at once respond to the new condition. Nature, with respect to stature, is dominant over nurture.

These three zoological criteria of race, cranial index, colouration and stature, are on the average inherited. Everyone knows that tall children may be born of short parents, dark-eyed children of fair parents, and to a much smaller extent round-headed children of long-headed parents. Individuals representing unmixed racial types are almost non-existent in the modern population of Europe, and, did they exist, the chances of their meeting and mating are infinitesimal. The results have to be worked out on

averages taken from large mixed samples of the population. This has been done on a sufficient scale, partly by private effort, and still more in continental Europe in course of the annual examination of the adult male population liable to military service. Fairly definite and clear conclusions have been reached. In any country or in any part of it, individuals present wide differences, but when the results are plotted out in some graphic form, the distinctions become clear because of the different

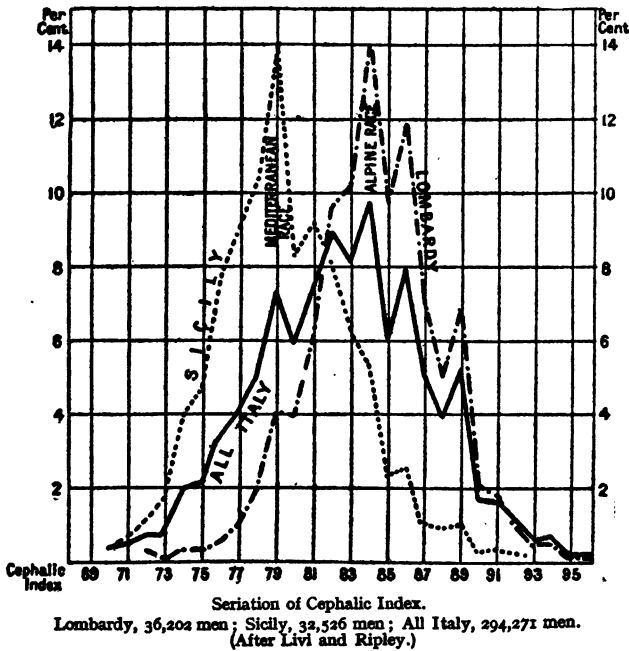


Percentage Distribution of Stature. (After Ripley).

positions of the peaks of the curves. Thus, in the diagram annexed, the stature of three large groups of men taken respectively from Scotland, North Italy and Sardinia is plotted out on curves. The horizontal line is graduated for heights increasing from left to right and the vertical line for percentages of men. Thus the height of each curve at any given point shows the percentage of individuals with the

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stature indicated vertically below on the base line. All three curves overlap, but it is clear that the Sardinians are preponderatingly short, the Scots preponderatingly tall, and the Ligurians intermediate. The second diagram deals with cranial indices taken from a very large number of individuals. The horizontal line is graduated for cranial indices passing



from long-headedness on the left to round-headedness on the right. The vertical scale, as in the previous case, shows the percentages of individuals. The curve to the left is taken from the skulls of 32,526 Sicilian males and has a high peak on the dolicho-

cephalic side of the scale. The curve to the right is taken from 36,202 men from Lombardy, and has a high peak towards the brachycephalic side of the scale. The curve for All Italy, based on measurements of 294,271 males, is much flatter, as it represents a larger and more mixed population, with a preponderance towards the broad-headed side and a minor peak corresponding with the Sicilian element.

The distribution of cranial index, colouration and stature in Europe has been well shown in a set of most interesting maps published by Dr. Ripley. A broad band of short-headedness stretches through Central Europe from France eastwards into Asia, separating two areas of long-headedness, the one on the north including the British Isles, Scandinavia, and a narrow strip along the Baltic, that on the south including the whole of Spain and Portugal, North Africa, Sardinia, and the South of Italy. The relative frequency of brunet traits increases rapidly from the north southwards, in so notable a fashion that did we not know the fallacy of attributing it to the direct effect of temperature, from consideration of the world as a whole, we should be disposed to dismiss it as a mere indication of bronzing by the sun. The map of stature shows here and there the influence of specially hard conditions of life, and probably the aggregation of members of the Jewish race, who are on the average short, is revealed in particular regions, as for instance in Poland, but apart from such special features, there is a gradual change from tallness in the north to shortness in the south, corresponding with the similar transition from fairness to brunetness.

The physical data derived from skulls, colouration and stature enable us to recognize the presence of three racial types or races amongst the white population of modern Europe. The Mediterranean or Iberian Race is distinguished by a low cranial index, dark colouration of skin, hair and eyes, and short stature. It is conspicuous on the shores of the Mediterranean, in the Spanish Peninsula, and along the western fringes of France and Great Britain, Brittany, West Ireland, Cornwall, Wales and the West Highlands of Scotland. The second race, usually called Teutonic, but better termed Nordic, as the word Teutonic has acquired a misleading political significance, is also long-headed but is tall and very blond. It is most obvious in north-west Europe, but sends outliers far into the south, reaching Bordeaux and down the Rhone valley to Marseilles.

The third race, often named Celtic, because of its historical connection with Celtic culture and Celtic language, but preferably Alpine, because of its present association with the highlands of central Europe and notable absence from what we call the Celtic fringes, is round-headed, stocky in size and intermediate in colouration between the blond Nordics and the dark Iberians. It forms a wedge entering Europe from a broad base in Asia, and intruding between the Mediterranean and the Nordic peoples.

Measured in years, the period of man's tenure of the earth, as we know it from the geological record, is almost immeasurably greater than what we call historical times. There must have been innumerable

migrations of races, risings and fallings of population exterminations, blendings and replacements of which we know nothing. In remote, prehistoric times, although much later than the earliest traces of the presence of man, a great part of Europe and North Africa (which from the point of view of geographical zoology is European) was inhabited by an extremely long-headed race with a lower cranial index than is found amongst any of the inhabitants of modern Europe. There is a close resemblance between this primitive population and the modern American Eskimo in skull-structure, stature, and culture as shown by habits and implements, and there is a good deal of support for the theory that this people retreated northwards with the receding ice of the glacial epoch. They were followed by the Mediterranean race, almost certainly a derivative of an African negroid stock. These were the people known to anthropology as the "long barrow type," from the shape of their burial mounds and excavations. They also were very long-headed, although the cranial index was not so low as that of their predecessors. They were short of stature and associated with the type of culture generally known as neolithic. They were ignorant of the use of metals, except gold, which was employed in ornaments, but their implements and weapons of stone were well-shaped and highly polished, showing a striking contrast with the rude workmanship of their predecessors. The race persists as the basal population of the northern and southern shores of the Mediterranean, of the Iberian Peninsula and of the south of Italy and France. Further north in France and

in Cornwall, Wales, Ireland and Scotland, they have been driven westwards towards the sea by the pressure of other races. In many parts of the actual coast line, they have been modified by sea-borne immigration of other stocks, so that they are often found, in their most typical form, a few miles inland. They are the characteristic inhabitants of the "Celtic fringes," although they have nothing to do with the race that brought Celtic culture to Europe.

The Mediterranean Race from the physical point of view is most closely related to the negroid African stocks. The members of this long-headed, short, and dark race are often vain, lively and excitable in disposition, prone to music, religion and superstition, and comparisons have been made between such mental characters and the characters of negroes. But, as I shall show in a later section of this book, it is impossible to distinguish the races of Europe by mental factors, and we have to remember that the grave Spaniard is as certainly one of the Mediterranean race as the excitable Welshman or Scotch highlander.

We know nothing definite as to the origin of the Nordic or Teutonic Race, but may guess that it was a derivative either of an early wave of the Mediterranean stock, or even of its more primitive predecessors, much modified by the harder conditions of northern Europe. Physically it is extremely long-headed, tall, and with a high percentage of blondness in skin, eyes and hair. Its centre of dispersal has been southwards and eastwards from Scandinavia and across the seas, and it has sent out wave after wave of conquering races far down into historical times.

The third or Alpine Race is Asiatic in origin. It is strongly round-headed, with an average cranial index over 90 and usually a rounded face, of sturdy build, varying locally in height, but usually taller than its Mediterranean neighbours on the south, and shorter than the Nordic types. The colouration is intermediate between that of the blond Nordics and brunet Mediterraneans, and the hair is seldom curly.

Now let us trace the distribution of the three races in the chief European countries.

Great Britain and Ireland.—I have already said that the basal population of Britain was of Mediterranean origin. Before historic times, these men of the long-barrow type were followed by a race from Europe, known as the round-barrow type. The cephalic index was fully ten points above that of their predecessors, and the stature was notably greater. They introduced a superior culture, pottery, implements of bronze and the habit of incineration and burial in urns. This race forms the Alpine or Asiatic strain in the British population, the source of the culture we know as Celtic, and quite possibly of the Celtic language. The invasion, however, was neither prolonged nor severe. It practically did not reach Ireland, just as snakes and other animals which have reached England from the Continent have failed to cross to Ireland, so that the curious position occurs that Ireland, which we associate specially with Celtic language and Celtic culture, is distinguished from the rest of the British Isles, and indeed from a large part of the Continent of Europe by having practically no true Celtic element amongst its inhabitants.

The Alpine immigrants were rapidly absorbed, leaving only rare traces in Cumberland, the Scottish Borders and a few isolated districts through the country where individuals rather above the average in height, strong-jawed with heavy cheek-bones and beetling brows, and short and broad heads, can still be identified.

The arrival of this outlier of the Alpine race was the last prehistoric contribution to the British stock. Since the beginning of historical times, there has been a constant series of invasions of the Nordic or Teutonic race from Europe, in most cases from the north of Europe. All these were typically tall and blond, long-headed and smooth-browed, and we know them as Jutes and Angles, Saxons, Normans and Scandinavians. They gradually saturated the whole of the British Islands, completely swamping the Alpine invasion, whose language and culture had been imposed on the earlier and more enduring Mediterranean stock, a stock that had itself been driven westwards. The result of all these events is the production of a markedly uniform type over the British Isles, prevailingly Nordic, but towards the west imperfectly blended with the equally long-headed, but short and dark Mediterranean race, and with here and there scanty remnants of the Alpine race.

France.—Of the modern nations, France displays the three European races in the least mixed form and so conspicuously that the differences are plain to any observant traveller who goes by road. Speaking roughly, there are three areas stretching obliquely across the country from north-east to south-west in

which cranial index, stature, and colouration reveal the preponderating presence of the three races in turn. The most southerly is the headquarters of the Mediterranean race, notable along the south and stretching up the Atlantic coast, where it is modified by admixture with Alpine and Nordic elements. The central highlands extend across France from their broad base in the Alps and Jura through the Auvergne and Cantal and the Cevennes towards the desolate Landes in the south-west, with outliers in the Morvan and in Brittany. These regions are occupied by the Alpine race, and the population shows a marked preponderance of round heads with high cranial index, medium stature with strong, stocky build, and medium colouration. In all these regions the Alpine race still clings firmly to the hills and the more inaccessible regions ; in the open fertile plains the cranial index is lower, falling almost directly with altitude. For wave after wave of Nordic immigration has brought a long-headed, tall, and blond population into France from the north ; this race has spread over the whole of the north, and has followed the plains and the river valleys down to Marseilles and Bordeaux.

Belgium and the Netherlands.—These countries seem to have retained almost no racial trace of the Spanish domination, and the population is a mixture of Alpine and Nordic stocks. The Dutch are conspicuously Nordic, tall, fair and long-headed, but towards the south, and especially on either side the lower waters of the Rhine, the Alpine race is revealed by a very great rise in the cranial index, a darkening of the colour and a shorter stature. In Belgium the boun-

dary between the area of Flemish dialect in the north and that of Walloon in the south corresponds rather closely with the division between the dominance of Nordic and Alpine races. The Flemish, like the Dutch, are tall, fair and long-headed ; the Walloons are shorter, darker and round-headed. It seems as if the highlands of Luxemburg (which is racially strongly Alpine), the hilly wooded country of the Walloons and the swamps of the Rhine delta had acted as fastnesses, preserving the Alpine race from the intruding Nordics.

Belgium offers a remarkable example of the confusion between race, language and nationality that has done so much to obscure political issues. The Flemish language is a form of Low German, allied to the Dutch language. Intercommunication between the Flemings and Germans along the frontier is therefore relatively easy, and none the less Belgian nationality has transformed an arbitrary line on the map to a real frontier. Even before the invasion of Belgium, it was a common saying among the Flemish peasants, when they had licked a platter clean : " At least there will be nothing left for the Prussians." The Walloons speak a language closely akin to French and therefore Latin rather than Teutonic. Although the national crisis has shown all Belgium to be a unanimous nation, resolute in the defence of its freedom, there remain traces of a rivalry, almost amounting to mutual distrust, between Flemings and Walloons, partly based on the belief of the Walloons that the Flemings were too ready to be Germanized, and of the Flemings that the Walloons were too susceptible to French influence. The

quaintest element in the situation is that the Flemings are racially Nordic or Teutonic, that is to say they belong to the race which the Germans claim to be but are not ; and the Walloons, who like to think themselves Latins, are characteristically Alpine, that is to say they belong to the race which preponderates in the German Empire.

Italy.—This country is divided geographically into two well-marked areas, the basin of the Po between the Apennines and the Alps (its southern boundary on the east is a little river north of Pesaro, the Rubicon of the ancients), and the long peninsula from the narrow strip of Liguria in the north down to Sicily. The basin of the Po is dominated by the Alpine race, and the Peninsula by the Mediterranean race. In the north the heads are round with a high cranial index running up to 96 and this drops gradually to the extreme long-headedness of the south. Similarly, the stature falls gradually from the relatively tall Alpines in the north to the very short Mediterraneans in the south, and the frequency of brunet traits increases notably from north to south. Italy shows an almost complete absence of the Nordic or Teutonic peoples, the few invaders who have found their way south having been absorbed. The Mediterranean race is dominant in the south and especially in the relatively inaccessible islands of Corsica and Sardinia. The Alpine invasion has reached a considerable way down the mainland but its headquarters remain in the north. ❄ ❄

Spain and Portugal.—The Spanish Peninsula shows a marked uniformity of racial type both in ancient and modern times. The heads are extremely dolicho-

cephalic, with low cranial index, the average stature is short and there is a great excess of brunet traits. It presents an almost unmixed example of the Mediterranean race. There has been a small invasion of Alpines in the north which has left a trace of greater stature and higher cranial index, but apart from that, the inhabitants, whether Moor or Spaniard, are of the same racial type.

Russia and Austro-Hungary.—Consideration of the racial type of Russia and Austro-Hungary leads us straight to the most acute points of controversy between ethnology and politics. The political view and the view firmly implanted in popular imagination is that the western boundary of Russia in the north, with a more disputable boundary in Austro-Hungary, correspond with the western limits of the Slavs, a typically Asiatic race of lower civilization which would swamp Europe, were it not in fact held in check by the German or Teutonic race. The term Slav, with its implications of language, political system and form of civilization, is misleading. From the racial point of view, the whole of Austro-Hungary and European Russia is occupied by a remarkably uniform population, a typically round-headed or Alpine race, indistinguishable from the Alpine race that extends through central Europe. Austria and Southern Russia show the type in its purest form, and the cranial index becomes lower, the height greater and the colouration more blond along a narrow band of European Russia stretching from Silesia to Petrograd and including Finland. Examination of skulls from burial grounds and old cemeteries has shown that in all the western

area of Russia and in Poland, the older population was longer-headed, as long-headed as the inhabitants of Great Britain, the replacement by the modern rounder-headed people being an event that comes well into historical times, that has not yet completely altered Poland and that has affected Finland least of all. Austria, Hungary and Russia are in fact the headquarters of the Alpine race in Europe, almost as much as Spain is the headquarters of the Mediterranean race. Russia contains in addition surviving elements of the Nordic race and a few scattered centres of extreme Mongol types such as the Lapps.

Germany and Scandinavia.—Until soon after the Franco-German War, it was the general belief that the German Empire was the home of a special race, the Teutonic race, long-headed, tall and blond. This view was made the basis of a national or political campaign and was the foundation of Pan-Teutonism. It still survives in the popular imagination, in the writings of some famous historians like Treitschke, of romantic idealists like Nietzsche, and of pretentious blunderers like Houston Chamberlain, the latter probably the least reliable of all who have peddled so-called philosophy to the public. In actual fact it is erroneous, but the position has been made clear only after a long and bitter controversy. Soon after the Franco-German War, de Quatrefages, in a pamphlet entitled *The Prussian Race*, which was deliberately controversial in tone and intended to annoy the triumphant German, alleged that the dominant people in Germany were not Teutons but were descended from the Finns, and even in Germany were alien barbarians ruling by the sword. Virchow

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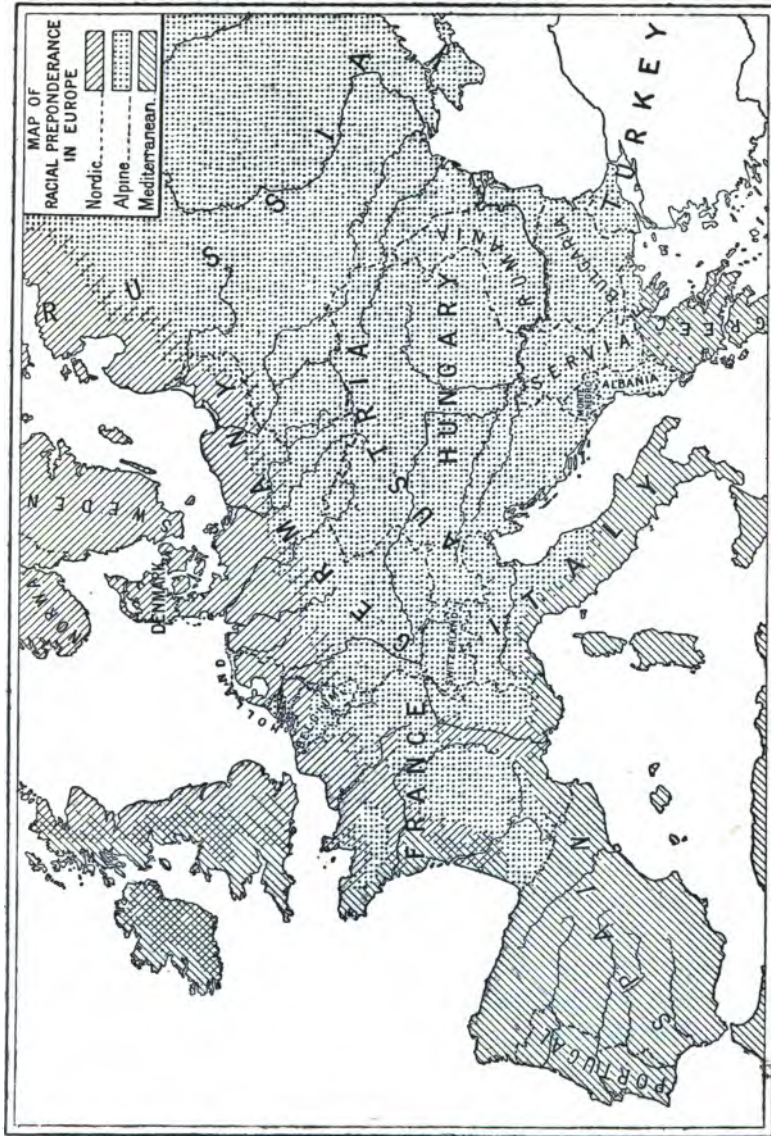
took up the challenge and persuaded his government to make an official census of the colour of the hair and eyes of about six million school children of the Empire. One of the results of this investigation was to show that the chief difference in pigmentation in Germany was between the north and south, and that the natives of East and West Prussia were in this respect as Teutonic as the people of Hanover. Unfortunately, however, the Prussian Army has been forbidden to make those investigations into cranial form and stature that have led to clear results in other countries. Unofficial investigations have led to the following conclusions.

Scandinavia, that is to say Norway, Sweden and Denmark, forms the headquarters of the Nordic or Teutonic race and it is probable that the original population of Finland was of the same type. It is a tall, blond, dolichocephalic race with rather smooth forehead and unsalient cheek-bones. The blondness often takes the form of red hair, as in Scotland and in the most Nordic parts of Russia. This race extends through North-western Germany, including Hanover, Schleswig-Holstein and Westphalia, but all the remainder of the German Empire, including Prussia east of the Elbe, is much less Nordic in type, and in Baden, Württemberg, Bavaria and the south, the Nordic race is replaced almost completely by the Alpine race. This difference of type is most apparent in cranial index but is confirmed by stature and to a lesser extent by colouration.

The Balkan Peninsula and Greece.—In the Balkan Peninsula, including Greece, the confusion of race, language and religion is extreme, and it cannot be

said that the materials for physical ethnology are as well known as in most parts of Europe. It seems clear, however, that the ancient Greeks were much longer-headed than the modern population, and were in fact typical representatives of the Mediterranean race. Afterwards, Alpine invasion had its effect, raising the cranial index from about 75 to about 81, and producing a mixture closely resembling what is found in the middle of Italy. The next interesting result is that the Turks, who form a small and decreasing proportion of the population of the Balkan Peninsula, are, from the point of view of race, no more Asiatic than the peoples amongst which they live. They are a highly round-headed race, but not more so than the Western Bulgarians, the population of Bukovina, the South Germans, or the Alpines in Savoy, and are less so than the Servians, Montenegrins and most of the inhabitants of Austro-Hungary. The Bulgarians and Roumanians, as a whole, are the least round-headed of the peoples of this region, and it has been suggested that they represent the remains of a Finnish stock. Most probably, however, the fertile basin of the Danube was occupied thickly by the primitive dolichocephalic inhabitants of Europe, and it is a survival from this element that has lowered the cranial index of the Bulgarians and Servians.

It is clear, therefore, that the existing political divisions of Europe do not correspond with the racial types of their inhabitants. Political frontiers are entirely out of harmony with racial frontiers, except, perhaps, in the case of Spain, where the Pyrenees form a racial demarcation. The map on page 63



shows this want of correspondence in a diagrammatic fashion, as there has been no attempt made to represent the various densities of the different racial elements. Great Britain is Mediterranean and Nordic with an absorbed Alpine element, absent from Ireland. France has the three races in a well-marked and well-separated form. Italy has the Mediterranean and Alpine races, distinct at the extremities, blended in the middle, and Greece presents a completer blend of the same elements. Austro-Hungary and the Balkan Peninsula are almost entirely Alpine and indistinguishable in this respect from Russia where the frontiers march. Russia is typically Alpine, but towards the north and west the Alpine population is imposed on an underlying Nordic strain, most distinct in Finland. Germany is preponderatingly Alpine in the south, centre and east, preponderatingly Nordic only along the north-west, and the Russo-German frontier cuts across the racial differentiation at right angles.

I do not dispute that modern nations are real entities. What they are I discuss in the next chapter, but at least it is clear that they differ from the units of zoology and botany in that the individuals composing them are not united by blood-relationship. Even if the struggle for existence were the sole law that had shaped and trimmed the tree of life, it does not necessarily apply to the political communities of men, for these cohere not because of common descent but because of bonds that are peculiar to the human race.

CHAPTER IV

THE PRODUCTION OF NATIONALITY : SELECTIVE FACTORS

ATTEMPTS, innumerable and unsuccessful, have been made to associate particular mental or moral characters with the three races of which the nations of modern Europe are composed. Thus when the statistics of suicide and of divorce were plotted out on the map of France, the areas of greatest incidence coincided with the Nordic or Teutonic race, as opposed to the Alpine race. In France, moreover, crimes against property are associated peculiarly with the Nordic race, crimes against the person with the Alpine areas, and the Nordic areas have a relative preponderance of radicalism and republicanism, and of artistic, literary and commercial success. But such associations of character with race break down when they are investigated in other countries. In Italy, for instance, the Alpine population in the north shows a great excess of precisely the features exhibited by the Nordic race in France. The distribution appears to be more closely associated with economic factors, with the presence of great cities, with the relative importance of town and country pursuits, and so forth. Modern Germany is prepon-

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deratingly Alpine from the racial point of view, and in its conduct of war has been strictly impartial in its choice of crimes against property or against the person.

The distribution of persons of genius or of high talent in any of the modern occupations of the human mind, or of the aberrations from normal conduct that we call criminal, has no reference to race. The Royal Families of Europe are closely related by blood, and yet each reigning sovereign is a just representative of the aspirations and proclivities of his people. The leading exponents of national sentiment cannot be separated by race. Of the two writers who seem to have done most to flatter or to nurture German megalomania, one, Mr. Houston Chamberlain, is an Englishman by birth, and presumably therefore chiefly of Nordic or Teutonic blood, and the other, von Treitschke, is doubtless a Slav and typically Alpine. We must suppose that with regard to the making of nationalities, the three races of Europe present equivalent mental and moral material. The great and increasing differences in the characters of modern nations are not racial.

Sir Ray Lankester has recently pointed out that much misapprehension has arisen from the use of the English word "culture" as if it were the equivalent of the German word "Kultur." Since Matthew Arnold preached the doctrine of "sweetness and light," culture, to an English ear, denotes possession of the graces of life, a polite, partly emotional, partly intellectual devotion to the arts and to letters, and to the gentler sides of philosophy,

science and religion. But there is an older significance of the word, surviving in such a phrase as the bacteriological term "culture-media." These media are mixtures—say of gelatine with various salts—in which bacteria can be grown, and the shape, mode of growth, and qualities of the organism are modified according to the composition of the medium. The same bacteria, grown in different culture-media, acquire different qualities. German "Kultur" corresponds with such a scientific use of the English word "culture." It includes the operation of the whole set of forces, partly selective, partly directive, political, educational, social, environmental that go to the moulding of the national character, everything, in fact, that nurture can impose on plastic nature. It has not only the passive significance of the results of nurture, but the active significance of the process of producing these results. It is the tilling and the harvest. In this sense the struggle between the nations is in truth a war of culture, a resistance by England and France, Russia and Belgium to the attempt to force on the world one particular conception of civilization. May I say in passing that even if we were to accept the German view that German "Kultur" leads to the highest ideal of civilization, submission to it would be no less a crime against the human race. We require variety, different ideals among which to choose, and freedom to make our choice.

The study of nationality is really a study of "Kultur." Naturalists have long realized the importance of isolation, Darwin's "corner-stone of the breeder's art," in providing the opportunity for

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divergent modification, whether the forces at work be those that can be referred to the principle of natural selection, or whether they are to be attributed chiefly to the direct influence of the circumambient media. If a group, consisting of members originally similar, be divided into two isolated groups, the combination of the circumambient media is certain to differ in the two cases, and thus, partly by selection, partly by repeated action in each generation, the isolated divisions will be moulded in different directions.

Geographical separation is the most direct form of isolation, and much of the work of Darwin, Wallace and their successors has been directed towards tracing how changes of level have raised scattered islands into archipelagoes, archipelagoes into continents, have joined and separated continents, have degraded them again into islands, so shuffling, redealing and shuffling again the species of animals and plants. They have discussed the effect of the barriers presented by arms of the sea, by rivers and mountain chains, by forests and deserts. The mere fact that nations occupy different geographical areas brings about a relative isolation of the peoples, for most individuals of modern populations are as surely fixed to their native soil as rooted plants and slow-moving animals. At first sight it would seem as if modern man, with his greater powers of prevision, intelligence and mechanical locomotion must be free from the limits of geography. But it is not so. An animal or a savage has only the convenience of the moment to tie him to any spot, and as his world is little more than

his own skin, wherever he is able to find food and shelter, he is at home. Modern man is bound to his locality by a thousand chains, forged by his more complex needs and emotions. In his case, moreover, there exist causes of isolation other than those found amongst animals. First there is language, with all its implications of thought and feeling, memories of past history, political and social ideals, differences that act strongly against freedom of intercourse, even where geographical barriers do not exist. Still more effective in producing isolation are the innumerable regulations, made for military and fiscal regions, hedging the frontiers. All the great nations, while they welcome the temporary visitor, are beginning to scrutinize the alien immigrant more and more closely, some of them accepting him only under severe conditions, all of them looking on him with little favour. Even when the frontiers are mere lines drawn on a map, indifferent to physical or racial features, the nations stand back to back, each facing its own capital, and in every way add to the difficulties of intercourse and so secure those conditions under which divergent modification is most rapid.

As the environment in two areas cannot be identical, the mere fact of isolation, even if not absolute, must lead to some divergent modification, but it also provides the opportunity for different systems of "Kultur" to produce their different effects on material that was at first practically identical. It is plain that the process may be of two kinds. It may actually modify the stock, so that in course of time the inborn qualities and capacities, all the charac-

ters that are transmitted and inherited, may come to differ in the different areas. There is a deep-rooted popular belief that the differentiation between the great nations has proceeded so far as to make the heritable qualities different. I have read in a French newspaper that a Bill is going to be introduced, or ought to be introduced, by a French deputy, temporarily legalizing the scientific destruction of the unborn progeny of the unhappy women of those parts of France that have been overrun by German soldiers. We may trust France, in dealing with such a proposal to combine the most resolute scientific decision with the most tender consideration of immediate and ultimate emotional results, and I should be very sorry to anticipate the judgment of those with the facts before them. But it is pertinent to say that two different motives underlie the proposal, the wish to relieve wretched victims of the hateful fruit of their bodies, and the belief that by such a method a foul progeny would be kept from contaminating the population of France with the evil inheritance of its male parentage. I personally should be prepared to go very far in the attempt to mitigate the distress of violated women, but, as will be shown subsequently, I am extremely doubtful as to the existence of a real danger to the French stock if it should be decided to take no action.

The process of divergent modification may come about in a second way. When inheritance and transmission play no part, each generation may be moulded afresh by the "Kultur" to which it is subjected. In actual fact, moulding of the stock and moulding of the individual act and react one

on the other, and it is not possible to disentangle the two sets of factors completely. But, for the purpose of enquiry, it is convenient to deal with the two separately, and I shall begin with those that seem to me of lesser importance, the various agencies that tend to produce divergent modification in the stocks.

A breeder may divide his herd in two ways before isolating the two parts. In each group he may place individuals chosen at random, or in one group he may place all those displaying one character in a marked fashion, say muscular activity, and in the other, those, say, of docile disposition. Divergent modification would follow isolation in either event, but we should expect to find that it was more rapid where the original division was purposive. There is a continuous elimination from many of the nations of those whose disposition is out of harmony with the political systems and ideals of their native country. From Germany, Italy, and to a lesser extent from France, there has been a drain of those who dislike, or fear, military service and the ideas associated with dominant militarism. Not only the direct pressure of economic conditions in Ireland, but emotional dislike of English rule have robbed Ireland, for many generations, of some of the best elements in her population. The glamour of the New World has attracted from every country in Europe the more restless and adventurous members of the population. Doubtless, as Germany has had few colonies promising an attractive career, she has suffered more than others in this respect, for those able to find careers in the dependencies and colonies of their own country

frequently marry at home, bring up their families at home and after a time return themselves. Germany must have lost permanently some part of the most valuable element in her stock, leaving the residuum a little more docile, with fewer windows open to the fresh air of the great world.

The same conscious preferences act negatively. Military nations do not attract and would not for long retain immigrants of other dispositions. How far and to what extent the actual stock is being modified in different countries, I cannot judge, and I do not know of exact work bearing on the subject. Theoretically, at least, we must suppose processes of internal selection to be active in the different isolated areas. All marriages are not fertile nor fertile to the same degree. The percentage of children produced from a given number of nubile persons differs in countries according to factors depending on the national character and environment. Prudential restraint upon marriage obviously differs from country to country according to the social, political and economic conditions that favour or impede early marriages in rural or urban population, or in one class or the other. A hundred nubile couples in one environment might have the same percentage of children as the same hundred in another environment, but the incidence of the fertility would almost certainly differ; precisely the same couples would not marry in the two cases. Actually we should expect that not only the incidence of fertility, but the actual percentage fertility would differ, especially if we take into consideration the habit of setting deliberate limits to fertility. Many able writers have

attached significance to the effects on a population of such differential controls on fertility, and some have suggested that certain nations are committing intellectual suicide, inasmuch as the more intellectual classes are proportionately less fertile than the lower classes. The subject is extremely complex. It is plain that many other factors come into operation, notably the circumstance that those classes in which fertility is limited from prudential considerations, at least secure that their children, although numerically fewer, are better protected against the accidents of early life, better educated and more successfully launched on their individual careers. I am very far from confident as to the direction in which such forms of internal selection may mould a stock, and still less confident as to the amount of their effect, but it is plain that the orientation and the quantity of the results must differ from nation to nation and so tend to the production of divergent modification. It is much more clear that the relative absence of intermarriage between persons of different nationality must act as a powerful factor of isolation, for so far as the stocks are concerned, isolation is no more than relative infrequency of intermarriage.

Whatever be the value of the various processes of internal selection, these must work differently in different nations. Galton, many years ago, suggested that the mental darkness of the Middle Ages might be due to the beliefs and customs that imposed celibacy on the finer and more intellectual spirits, and we may at least be certain that in each nation those variations that are in harmony with the system of "Kultur" of a nation will be at no disadvantage.

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War must have an important effect differing from country to country. It acts in many ways, varying with the number, frequency, and extent of the wars actually undertaken, the relative reward given to those who become professional soldiers, as compared with the rewards of other professions, the objects for which war is undertaken, the nature of the enemy, and many other factors. Opinions as to the nature of the effect of war on nations are diverse. Darwin, as usual, when he was dealing with deductive inferences and not drawing generalizations from known facts, was extremely cautious, in striking contrast with many of those who claim to be expounding or attacking his opinions. Writing of the effect of war as a selective agent, he said: "It is extremely doubtful whether the offspring of the more sympathetic and benevolent parents, or of those who were most faithful to their comrades, would be reared in greater number than the children of selfish and treacherous parents of the same tribe. He who was ready to sacrifice his life, as many a savage has been, rather than to betray his comrades, would often leave no offspring to inherit his noble nature. The bravest men, who were always willing to come to the front in war, and freely risked their lives for others, would, on the average, perish in larger numbers than other men. Therefore it seems scarcely possible (bearing in mind that we are not here speaking of one tribe being victorious over another) that the number of men gifted with such virtues, or that the standard of their excellence could be increased through natural selection, that is, by the survival of the fittest" (*Descent of Man*, first edition, I, p. 163). In

another passage, speaking of the war between two tribes of savages, he suggests that the advantage might go to those with higher moral qualities. "Let it be borne in mind how all-important in the never-ceasing wars of savages, fidelity and courage must be. The advantage which disciplined soldiers have over undisciplined hordes follows chiefly from the confidence which each man feels in his comrades" (*Id.* p. 162). In a passage, added in the second edition, Darwin referred to the probable evil result on a modern nation of conscription. "In every country in which a large standing army is kept up, the finest young men are taken by conscription or are enlisted. They are thus exposed to early death during war, are often tempted into vice, and are prevented from marrying during the prime of life. On the other hand, the shorter and feebler men, with poor constitutions, are left at home, and consequently have a much better chance of marrying and of propagating their kind."

It is at least clear that Darwin cannot fairly be cited, as von Bernhardt and others have taken him, as a witness for the proposition that war is the great elevating force of nations. On the other hand, I cannot be so certain, as some ardent eugenists, that the total effect of even a great modern war deteriorates the stock. Dr. Starr Jordan, of the Leland Stanford University, in a little book, *The Human Harvest* (Rivers, London, 1907), discussed the results of the loss of the young, strong and brave in war. Dr. Saleeby, in an address delivered before the Manchester Statistical Society in November, 1914, referred to the "reversed selection" due to

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such loss as "the longest price of war," and Professor J. Arthur Thomson, in a recent Galton Lecture (*Nature* Vol. 94, p., 686), referred, rather more doubtfully, to modern war as being "on the whole dysgenic." But even on the physical side, the evidence is vague and conflicting. The relatively low stature in France, which has been adduced as a consequence of the Napoleonic campaigns, is without doubt racial, and it is still lower in the southern half of Italy, which was very slightly affected by the great wars of the First Empire. No certain inferences can be drawn from the evidence of the actual results of the Franco-German War. In the year of the war there were 75,000 fewer marriages than usual in France. In 1871, on the conclusion of the war, an unprecedented number of marriages took place. Professor W. Z. Ripley (*The Races of Europe*, p. 88) has summed up what is known as to the physical effects on the population as follows: "Two tendencies have been noted, from a comparison of the generations of offspring severally conceived before, during, and after the war. This appeared in the conscripts who came before the recruiting commissions in 1890-92, at which time the children conceived in war-times, became, at the age of twenty, liable for service. In the population during the progress of the war, the flower of French manhood, then in the field, was without proportionate representation. There must have been an undue preponderance not only of stunted men rejected from the army for deficiency of stature alone but of those otherwise physically unfitted for service. Hence the population born at this time ought, if heredity means any-

thing, to retain some traces of its relatively degenerate derivation. This is indeed the case. In Dordogne this contingent included nearly seven per cent. more deficient statures than the normal average. Quite independently, in the distant Department of Hérault, Lapouge discovered the same thing. He found in some cantons a decrease of nearly an inch in the average stature of this unfortunate generation, while exemptions from deficiency of stature suddenly rose from six to sixteen per cent. This selection is not, however, entirely maleficent. A fortunate compensation is afforded in another direction. For the generation conceived of the men returned to their families at the close of the war has shown a distinctly upward tendency almost as well marked. Those who survived the perils and privations of service were presumably in many cases the most active and rugged; the weaker portion having succumbed in the meanwhile either to wounds or sickness. The result was that the generation conceived directly after the war was as much above the average, especially evinced in general physique more than in stature, as their predecessors, born of war-times, were below the normal."

I must add still further to the dubiety of the "dysgenic" effect by recalling the great importance of hardship on the individual life in reducing general physique and stature. The Dordogne area, in which the fall in stature was most conspicuous, contains some of the poorest regions of France, and although Hérault has a fertile and prosperous southern margin many of its inland portions are bleak and barren uplands. In such districts the general economic

hardship of war would press extremely severely and might easily handicap a single generation without affecting the stock to any appreciable extent.

I do not wish to linger over a question in which so much is theory and so little ascertained fact, but I shall submit a few more considerations to those who are interested in the academic discussion of the possible effects of war on the stock of a nation. No doubt it may be urged that many of the bravest are likely to perish in war ; but many of those whose natural disposition is martial must also disappear. Everyone knows persons, especially amongst those who have no experience of what war really is, who covet the "crowded hour of glorious life" for its own sake and who would submit themselves and others to the peril of fighting with very little provocation. If this consideration be pursued on theoretical lines, the inference might be drawn that forty years of unbroken peace have made Germany too ready to embark on war, as there has been no opportunity for her fire-eaters to be eliminated. Nor must we forget that after a war, the returned heroes are attractive to women, are financially favoured wherever possible, and that every effort is made to provide for the orphans of those who have perished. The excitement of war, the peril of undecided events, the joy of victory and the coming of peace (even to the vanquished) thrill through a nation, and are at least as compatible with high and selective reproductive activity as is the placid spirit of normal conditions.

If for the present we must remain in doubt as to how far the initial stock of nations can be modified

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on the physical side by selective agencies, how much more dubious must we be in the case of mental, moral and emotional qualities? I regard with dismay such bold pronouncements as those made by Professor Bateson, in the second part of his Presidential Address to the Australian Meeting of the British Association, for although he himself has been wise enough to refrain from particular instances, he has opened the flood-gates to dogmatic quackery. For there is no scrap of positive evidence in favour of including mental potentialities and aptitudes in such a generalization as the following: "With little hesitation we can now declare that the potentialities and aptitudes, physical as well as mental, sex, colours, powers of work or of invention, liability to diseases, possible duration of life, and the other features by which the members of a mixed population differ from each other, are determined from the moment of fertilization." There is nothing but theory to support the proposition that in the case of man, nature has "an overwhelmingly greater significance" than nurture. Whether such views be true or not, I do not know; no one knows. They are inferences from "characters on which we can experiment"; from the combs of chickens, the feathers of pigeons, the stature of hybrid peas, the inheritance of defects of the eyes, of abnormalities of the blood-vessels and of pigments. What I do know is that there is the whole difference in the world between "mute inglorious Miltons" and the actual Milton who wrote *Paradise Lost*. Whatever was determined at the moment of fertilization of the egg-cell which grew into Milton it was a very tiny factor in the production of the "organ-

voice of England," the "name" to resound for ages."

The piece of Miltonoplasm, for so I may call the fertilized egg-cell by which, on this Laputan theory, Milton was determined, required the presence of a peculiar environment for nine months before it could be born as a healthy human child, the whole past history of the English language and of contemporary English "Kultur" to make it an English speaking boy, the Hebrew cosmogony, the poets of Greece and of Rome and of Italy, our own Shakespeare and the multitudinous splendour of the Elizabethan age, the struggle between Puritanism and the Church, between King and Parliament, the rise and fall of the Commonwealth, a vast turmoil of epic days, to shape the poet's mind and to inform his music with colour and passion, with stately harmonies and the light of heaven and the depths of hell. "Potentialities and aptitudes!" Grant that they were fixed at the moment of conception, and what further are we? The whole past history of sentient man, preserved and perfected from age to age in his traditions and his religion, in comely speech and in the treasures of literature were needed, to make the possible real.

I view the clamorous pretensions of the Mendelian eugenists with a mixture of hope and fear. Of hope, for among them are very able, patient and devoted biologists. They are pressing nature close with experiments, hot-foot on many processes that were vague and mysterious even to Darwin. They have given us, I hear, a rust-proof wheat, many quaint flowers and a prescription for breeding streaky bacon, and they will give us much more. But, on their own showing, and Professor Bateson himself

is emphatic on the matter, they have not yet moved a single step in the direction of showing how to breed Miltonoplasms. So far, they have brought no more to the solution of the peculiar qualities of man than is contained in the old proverb: "You cannot make a silk purse out of a sow's ear." Certainly the silk-worm, spinning its cocoon, provides a material with the potentiality and aptitude of being made into a silk purse, but silk-worms might spin to all eternity and yet fair ladies still have to carry their money in their hands. By all means let us hope that Mendelians will teach us how to multiply the fine silk of human capacity, but we must fear them when they claim an overwhelmingly greater significance for the silk than for the making of the purse. They forget the dominance of what we call mind over what we call matter. It is after the Miltonoplasm has grown into a sentient human being that the factors most potent in shaping the direction, quality, and value of his mental and emotional output come into operation. These factors are in his environment, not in himself: they are products of the "Kultur" of the nation in which he lives, and they, at least, are created by human will and are subject to human will.

Quite possibly some definite elements could be removed from a national stock by restrictions on breeding—such elements, for instance, as feeble-mindedness. But we cannot be certain that feeble-mindedness is not due to a gross physical cause affecting different kinds and qualities of brain and mind, just as blight may fall on the fairest flowers and the most ragged weeds. When we consider oriented abnormalities of mental and moral dis-

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position, it at once becomes apparent that the connection between mind and body is extraordinarily evasive. We must regard serious crime, I suppose, as an abnormality. The results have recently been published of an elaborate investigation of the convict population of Great Britain. It appeared that these criminals, persons whose offence was sufficiently serious to have received a punishment of more than two years' imprisonment, were in all respects a normal sample of the population differentiated only by the circumstance that they were convicted criminals. Here, surely, it is environment rather than inborn disposition that is at work.

I do not believe that in the present state of knowledge we can assume the existence of an actual modification of the stock of the different nations, or that we can guess at the direction given to such possible modification by any of the supposed selective agencies. With regard to mental, moral and emotional qualities, which are of preponderating importance in man, I do not believe that theory is in a position even to suggest modes in which they could be favoured or hindered by rules of breeding. As I shall proceed to show in the next chapter, nurture is inconceivably more important than nature. The environment of the body and the environment of the mind determine national differences. These variable factors, and notably the environment of the mind, differ from the factors that rule in the animal and vegetable kingdoms inasmuch as they involve conscious human intelligence and choice, conscious imposition on the part of the rulers and conscious acquiescence on the part of the governed. Even if it

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were now possible to regulate human mating, so as to favour the production of Miltonoplasms, Darwino-
plasms, and so forth, insistence on this side of the
question diverts attention from the much more easy
and much more certain possibilities of modifying
" Kultur."

CHAPTER V

THE PRODUCTION OF NATIONALITY : EPIGENETIC FACTORS

IN my opinion the most important of the moulding forces that produce the differences in nationality are epigenetic, that is to say that they are imposed on the hereditary material and have to be re-imposed in each generation. In the last quarter of the nineteenth century, August Weismann investigated the modes of origin of the sexual cells of the *Hydromedusæ*, and discovered that the male and female reproductive cells of these branching, plant-like animals sometimes ripened in bud-like outgrowths, sometimes in portions that broke off and floated away as little swimming jellyfish. But however or wherever they finally appeared, they could be traced back through the whole development of the branching colony to the original fertilized egg-cell from which that colony was developed. He extended his observations to many other kinds of animals, and came to the general conclusion that a fertilized egg-cell, which is the starting-point of an animal, the joint contribution of the male and female parents, divides into two portions. One portion, growing, dividing and multiplying, slowly builds up the new individual, and its daughter-cells, as they are marshalled to form

the tissues of the new individual, acquire the special properties of nerve-cells, muscle-cells, digestive-cells, all the varied cells that compose the adult body, and at the same time as they become specialized, lose the general capacity to reproduce all the qualities of the animal. The other portion may increase in size, and may produce many daughter-cells, but these are all alike, contain all the inherited qualities of the organism, and form the sexual cells of the new generation. In such a fashion the germ-plasm, or hereditary material of the stock, is handed on from generation to generation. It lies passive in the tissues, protected and secluded from the changes and chances that the environment may write on the body of the individual containing it. Weismann's observations have been confirmed in the main, and it is now generally accepted that the germ-plasm or hereditary material, if not absolutely free from the influences of the environment, has at least a very high degree of stability, and hands on to the new generation the characters of the generation from which it came, with little contamination from the effects of the environment on the organism in which it lies. Weismann's theory thus led to re-examination of the belief in the inheritance of acquired characters, and although opinion is far from unanimous, there is general agreement that the inheritance of plastic effects, of the moulding influence of the environment on the individual, is on the average extremely slight.

On the other hand, we are gaining an increased knowledge of the power and effect of the environment on each individual life. The resemblance between

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parents and their offspring comes about in two ways ; there is the common hereditary material, ready in parent and child to respond in the same way to similar environmental forces, and there is the fact that the forces of the environment acting on parent and child are usually alike. We must realize that the environmental forces are as necessary to the final result as is the initial material, but we are apt to neglect them because of their constancy. As I have already said, it is impossible to separate the selective from the plastic effects of the environment, and when similar conditions have persisted through many generations, selection must have been at work. Only those strains capable of responding successfully to the prevailing conditions can maintain existence, so that there is a continuous and gradual elimination of the other strains. Thus it has come about that all life has grown old and formal with regard to the persistent features of its environment, and if these are not present, it fails to develop and dies.

With regard to a much larger number of factors than we are inclined to suspect, the possibility of response to alternative conditions persists. Alpine conditions, for example, with their combination of decreased atmospheric pressure and increased humidity, greater radiation and extremes of heat and cold, cause immediate changes in all animals and plants that are not at once killed by the transplantation. Removal from the hills to the plains produces a direct effect on plants, animals and human beings. Transference to a warmer climate thins the feathers of birds and the fur of mammals. The keeping of monkeys out of doors, and the transference of the

bears from small and warmed cages to the greater exposure and freedom of the Mappin Terraces at the London Zoological Gardens have improved the quality and thickness of the fur in a single season. Plants that usually bear thin and hairy leaves produce smooth and fleshy leaves almost immediately under the influence of increased moisture and salinity, and the structure of water-shrimps and molluscs varies with the saltiness of the water in which they are reared. The nature of the food affects the size, appearance, structure and fertility of many plants and animals. The circumambient media are the active agents in producing the average character of most populations, but we are apt to overlook them, partly because of the unsettled controversy as to the inheritance of acquired characters, and partly because we fail to allow for constant agents, and so attribute to nature what is due to nurture.

The conditions of the environment, which differ from nation to nation, act directly on each generation. We may suppose even that they have an influence on children before birth. Alcohol, cocaine, and many bacterial poisons and diseased conditions are known to affect the embryo through the blood of the mother. The influence of the nutrition of the mother has probably much to do with determining the physiological rhythm of the child. Some years ago great notoriety was given to a theory that the sex of an unborn infant could be determined by regulating the quantity of sugar in the tissues of the mother, and although enquiry did not confirm this particular suggestion, there is no doubt that the mother is much

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more than a neutral feeder of her embryo. There are even selective factors at work. Statistics collected in one country showed that the average size of the head was greater in still-born children than in children born alive. No doubt the relative size of the brain, especially at the time of birth, is an indication of the possible degree of intelligence that would require much correction from other factors, but it is not without significance. It is clear that the conditions of the environment, such as climate, food and air, the requisites sought for in wives, and the treatment accorded to pregnant women all differ from country to country, and probably have some direct action in determining the average brain-size of a nation. Equally important, and varying with the social environment from country to country, is the relative fertility of different classes of the community. Populations in which large families are encouraged, or the reverse, respectively in the upper and lower classes, or in the agricultural or urban sections, will soon come to show marked differences, not so much because the material differs, but because it will be reared under different conditions.

The direct effect of the circumambient media on the youth and on the adult is better known. When a special environment acts even for a limited time on a young man, we notice the results as producing an unfamiliar and foreign air. Who has not marked such effects on an American who has spent some years in Paris, a Scot who has been in a New York counting-house, or the member of an English embassy home on leave from any foreign country? We set down the changes to imitation, conscious or

unconscious, and attach little significance to them. But they are only the superficial part of reaction to a new environment, and the changes in physiognomy, palate, habitual diet, digestive powers, and general habits have their definite physical correlates in changes of blood and brain and physiological rhythm. Such influences are more marked when they have acted through the whole life, and they mould a population in one direction.

Among modern civilized peoples, however, the circumambient media that are most important and that have the greatest effect are those affecting the mental and emotional qualities. From earliest childhood, the young Englishman, Frenchman, German and Russian are moulded in different ways. The systems of education, the books that they are given to read, the aspects in which history is presented to them, their companionship at school, the examinations they have to pass, the modes of entrance into professions or into commercial life, their military service, all stamp them with a separate nationalism.

Physical differences are slow-moving secular affairs, their summation being effected only after long ages. The results of the environment on the mind are reflected in literature and the Press, and yet almost limit themselves to the confines of each nation, for the numbers of a nation that read an alien literature or take their daily prejudices from an alien newspaper are almost negligible. Although the physical and mental qualities that are acquired by an individual are not transmitted to his descendants but have to be acquired afresh in each generation, every new acquisition by a literature is inherited.

The new generation begins at the stage in which its predecessor left off; every wave of emotion, of sentiment, of ideal that traversed the former generation is stored in literature. A similar difference in the rate of acquisition of characters is to be seen when we compare a plant propagated by slips with a plant propagated by seed. However a plant may have been protected or favoured in its individual life, the seedling grown from its seed has to start afresh. But where a plant is propagated by slips, the whole series is a continuous life; the kindly effects of each ray of the sun, each pruning and grafting by the gardener, each condition of soil and temperature has left a permanent mark, enduring while the plant endures. Literature is a new organ of a nation, transcending the individual life, being shaped and growing from generation to generation, and forming a permanent mental environment of the most powerful kind. It is the organ of "Kultur," giving a life, continuous through all change, to the national ideals, emotions, political and social systems, conceptions of justice and religion. Its effects are profound, far-reaching and acute, and it serves to differentiate nations, however closely alike may be their initial racial constitution, in a fashion that is new and peculiar to man.

I am convinced that most of the agencies affecting the differentiation of nations, whether they be physical conditions bringing about physical changes, or the much more important agencies acting on the mind and emotions, are epigenetic. So far as they are concerned, the mind and the body of the infant are neutral, clean sheets on which many kinds of writing

may be impressed. I cannot insist too strongly that all these factors acting on man are altered and heightened and made immeasurably more powerful because of a new element in them, an element unknown in the animal and vegetable worlds, the element coming from human consciousness. There is conscious choice on the part of those who impose the factors, and conscious acquiescence on the part of those who accept their imposition. Lord Bryce no doubt had such a consideration in view, when, in a recent speech on the relations between race and history, he suggested that the teaching of history ought to be forbidden. All the most important agencies producing the divergent modification of the nations are human products and can be altered.

This brings me straight to the most difficult stage of my argument and I must now discuss what is the precise difference between men and animals. I believe that a correct solution of this problem would put out of court for all time any attempt to justify human conduct by referring it to laws that may be supposed to rule the animal and vegetable kingdoms.

We believe now that the origin and zoological position of man has been established beyond reasonable doubt. He belongs to the Vertebrata, the thirteenth phylum, or major division, of the Enterozoic Metazoa. The vertebrates are divided into five classes, Fishes, Batrachians, Reptiles, Birds and Mammals. Man is a mammal. The mammals are divided into many Orders, and man belongs to the order Primates, which includes two sub-orders, the Prosimiæ or Lemurs, and the Anthropoideæ, or

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monkeys, baboons, great apes and human beings. We only smile now when we recall the desperate efforts of anatomists in the second half of last century to find some detail of structure on which they could separate man sharply from the great apes. Even if we consider living forms alone, it is difficult to say that man differs in structure from the gorilla more than the gorilla differs from a macaque or a baboon. And if we take into our view the recent discoveries in the fossil history of man and of the great apes, the differences fade away, and we are confident that at some period in the late Tertiary geological epoch, man and the great apes had a common ancestor. Not only in structure but in the functions of the body is this affinity clearly marked. The range and nature of our senses, the physiological rhythm of our body, our reproductive and digestive functions, our instincts and aptitudes, our resistance or liability to special diseases, even the kinds of parasites that affect us, all mark us down as slightly modified apes. Any non-human physiologist or anatomist unbiassed by a partiality for man, might not assign man even generic value in his system of classification. None the less we know that man has come into possession of a peculiar quality which can be indicated in such phrases as "consciousness" and "sense of freedom."

There are two modern fashions of dealing with this peculiar quality, and to my mind these agree in obscuring or evading the real issue.

The first school, which arrogates to itself the claim of being scientific and is disposed to brand those who do not accept it as obscurantists, is obsessed by the idea of man's animal origin. It

explains everything human by analogies drawn from the animal kingdom. It goes to the insects to find explanations of human social organizations. It explains man's ferocity by reminding you of the ape and the tiger. The fox and the jackal excuse his cunning. The dog foreshadows his friendliness and reverence. His foresight and care for his family find their prototypes in every branch of the animal kingdom. His marriage customs and family life can be interpreted by studies of the rabbit and guinea-pig, and the differences in character between men and women can be traced back to the vagrant male-cells and plump, quiescent egg-cells of a sea-weed. Human nature is interpreted in terms of protoplasm.

It is quite true that the whole web of life is in physical and physiological community, but considerations drawn from any part of it require so much modification before they can be applied to any other part, that they become merely verbal. Birth and death, sex and reproduction, respiration and nutrition are functions common to all forms of life, and their manifestations are limited and conditioned by the properties of protoplasm, the living material that forms the tissues of all animals and plants. Human beings can express themselves only through the material of which their bodies are made, and the properties and limitations of this material necessitate a close resemblance among the forms of expression of all kinds of living beings. None the less "All flesh is not the same flesh; but there is one kind of flesh of men, another of beasts, another of fishes and another of birds." If St. Paul had been an anatomist he could have

added many other kinds of flesh to his list. It is impossible to make correct comparisons even between say an insect and spider, two creatures so closely allied that only zoologists would separate them, unless we could trace the qualities of the insect and of the spider respectively down to their common ancestor, and in so doing we should almost certainly lose all that made the comparison interesting and significant, and be left with little more than the qualities common to all protoplasm. Comparisons between man and the different members of the animal kingdom are subject to precisely the same defects. It is merely futile to range up and down the animal kingdom, picking a resemblance here and a resemblance there; only the tracing back of human qualities down the exact line of ancestry of man, whatever that may be, could help us, and even were that done, no doctrine of origin, nor proved fact of origin could obliterate the distinctions between man and beast. However fruitful and interesting it may be to remember that we are rooted deep in the natal mud, our possession of consciousness and the sense of freedom is a vital and overmastering distinction.

The second mode of evading the difficulty is the special property of vitalists and of Professor Bergson and his followers. It is at once more fashionable and more fatal. It recognizes fully the amazing importance of the conceptions consciousness and sense of freedom as we know them in ourselves,—and we have no other source of information. Its way of avoiding the apparent implications of the doctrine of descent, is to associate consciousness and the sense of freedom not merely with human life but with all

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life. I am anxious not to appear to parody the view and I shall quote a typical presentment of it from a Huxley Memorial Lecture, recently delivered by Professor Bergson in the University of Birmingham. It is almost a joke, a bad joke, that the following passages form part of a Huxley Memorial Lecture. Speaking of the *Amœba*, which is one of the unicellular animals with least visible structure, consisting of a nucleated mass of protoplasm, Bergson said :

" This mass can change its shape at will . . . it is therefore vaguely conscious. Now, in order to develop and evolve, two courses are open to it. Either it may follow the path towards movement, action . . . action growing more and more complex, more and more deliberate and free, as time goes on ; this means adventure and risk, but means also a consciousness more and more wide-awake and luminous."

Again :—

" With the coming of life we see the appearance of indetermination. A living being, no matter how simple, is a reservoir of indetermination and unforeseeability, a reservoir of possible actions or, in a word, of choice."

This device of carrying consciousness and choice backwards is not limited to philosophers ; it has invaded some exact investigators on the strictly technical side of zoology. My friend, Mr. E. Heron-Allen, for instance, who has been engaged for some years on a patient study of the Foraminifera, a group of Protozoa characterized by the possession of shells of beautiful and varied structure, ascribes

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the phenomena of "purpose" and "intelligence" to these creatures, in the "construction of their tests, either with a view to adaptation to environment or for defensive purposes." Sometimes the shells or tests are composed of rare materials such as fragments of garnet or magnetite, picked out from more abundant material; sometimes of sponge spicules, of particular lengths or arranged in particular ways, so as to be suitable for a muddy ground or such other local condition. Paley would have regarded such adaptations, which of course abound in the different groups of the animal kingdom, as evidence of the existence, power and wisdom of the Creator. In the fashionable modern philosophy, which, very curiously, has been hailed as a rescuing of science from the clutches of Darwinian materialism, they are held to testify to purpose and intelligence in the Protozoa.

Intelligence, purpose and choice, are meaningless phrases unless they imply consciousness and the sense of freedom. Anyone who has seen mobile micro-organisms darting hither and thither or writhing through a drop of blood, under the high power of a microscope, or in the beautiful cinematographic films of Messrs. Pathé, will readily extend the conceptions of unforeseeability and spontaneity to them, at least if he has no knowledge of the fashions in which their movements can be accelerated, retarded and controlled by conditions that an expert is able to alter.

If consciousness and freedom, purpose and intelligence are to be ascribed to lowly animals, I can see no reason why they should be withheld from the

vegetable kingdom. If a bean be thrust into the soil, under conditions suitable for germination, the shoot struggles up towards the light, as if it knew that its expanding crown of green leaves had to be exposed to the air and sunlight, and its root wriggles downwards, thrusting aside the smaller stones, twisting round the larger, seeking darkness and moisture and the chemical substances the plant requires. If the bean be placed in the soil upside down, the shoot, almost as soon as it protrudes, bends upwards, making a curve to reach the light, and the root in similar fashion curves downwards over the bean, towards the conditions proper to its functions.

Why should we stop with the organic and not continue to see purpose and will in the inorganic world? Why not see choice in the wind "blowing where it listeth," purpose in the cleansing rise and fall of the sea "in its priest-like task of pure ablution, round earth's human shores"? It has often been pointed out that water behaves differently from other liquids when it is cooled. Most liquids contract as their temperature is lowered and reach a maximum density when they congeal, so that the solid sinks in the liquid of which it is formed. Water contracts until the temperature is slightly over the freezing point, and then expands so that ice is formed on the surface. This has been alleged as an instance of the wisdom of the Creator, preventing oceans and lakes and rivers freezing from the bottom upwards into solid masses of ice that would make the globe uninhabitable by man. But why should the benevolent wisdom not be ascribed to the ice? In a word, why should we not return to the beautiful

legends of Greece, and see conscious and capricious personality in the sun and moon, in stars and comets, in clouds and storms, in rivers and springs? Why not? I do not see any logical break in such an extension of consciousness and purpose. But it is the synthesis of poetry and not the calm observation of science.

The Bergsonian interpretation does nothing to make consciousness and freedom more intelligible, and by extending them from man, in whom we know them to exist, to animals, in which their presence is at best an inference, it not only robs them of definiteness and reality, but it blurs the real distinction between men and animals, and evades the most difficult problem of science and philosophy. The facts are more truly represented by such phraseology as that animals are instinctive, man is intelligent, animals are irresponsible, man is responsible, animals are automata, man is free, or if you like, that God gave animals a beautiful body, man a rational soul. The distinction is put most subtly in Mr. Maurice Hewlett's *Lore of Proserpine*, in which deep insight and wise psychology are presented as fair flowers of parable. Mr. Hewlett is comparing the human mind with the mind of a non-human being, mentally akin with the animals :

“ We humankind, with our wits for ever turned inward to ourselves, grieve or exult as we bid ourselves ; she, like all other creatures else, was not in that self-relation ; her parts were closer-knit and could not separate to envisage each other. So, at least, I read her . . . that she lived as she could and as she must, neither looked back with regret nor

forward with longing. Time present, the flashing moment, was all her being."

Not "envisaging itself," not being at once actor, spectator and critic, "living in the flashing moment," not seeing the past and the present and the future separately, this is the highest at which we can put the consciousness of animals, and herein lies the distinction between man and the animals which makes the overwhelming difference.

Must we then suppose, with Russell Wallace, that somewhere on the upward path from the tropical forests to the groves of Paradise, a soul was interpolated from an outside source into the gorilla-like ancestry of man? I do not think so, although I not only admit but assert that such a view gives a more accurate statement of fact than does either of the fashionable doctrines that I have discussed. I believe with Darwin, that as the body of man has been evolved from the body of animals, so the intellectual, emotional, and moral faculties of man have been evolved from the qualities of animals. I help myself towards the comprehension of the process by reflecting on two phenomena of observation. I help myself, and perchance may help others; no more; could I speak dogmatically on what is the central mystery of all science and all philosophy and all thought, my words would roll with the thunder of Sinai.

The first phenomenon of observation which encourages me is that the properties of a compound are not merely the sum of the properties of the constituents of the compound. Who could infer the qualities of water simply from a knowledge of the

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qualities of oxygen and hydrogen? What strange and complex alchemy may we not expect, when the various animal instincts, faculties and qualities have surged up into the field of the human mind, there to be irradiated by human consciousness and set dancing in new and harmonious concert?

The second phenomenon that appears to help is the occurrence of what are called critical phases in continuous processes, points at which the character and qualities change quite suddenly. If a mixture of starch and water be stirred in a saucepan over the fire, nothing seems to happen for a long time, and then quite suddenly the mixture becomes thick and you have much ado to keep it from burning. Under a continuous rise of temperature, a solid suddenly passes into a liquid and a liquid into a gas. The properties of the solid, liquid and gas are very different, but the intermediate phases, if they exist at all, are so fleeting that it is almost impossible to assign them characters. The much more complex embryological history of animals teems with such critical phases, as for instance when the tadpole becomes an air-breathing frog, or when the young of a mammal, at the time of birth, changes from a parasite with empty lungs to an air-breathing, independent creature. After birth a human child is still a senseless automaton, but gradually the branches grow out from the nerve-cells, linking cell to cell and cell to tissue, and quite suddenly you see the light of intelligence dawning in the eyes and become aware that a new soul has taken possession of a new body.

Take the power of memory, a quality that is an inseparable part of human intelligence and freedom.

We find a beginning in the non-living world. Some record of each stimulation survives in the structure of the object stimulated. The steel of a bridge slowly becomes crystalline as trains continue to pass over it. In this case the memory, so to say, is permanent. A steel spring set to vibrate after a time responds less to the same stimulus ; it has become " fatigued," but if it be allowed to rest, it recovers tone. In this case the memory is short. Often in the last few miles of a long motor drive, I have found the engine not " pulling " so well ; next morning, although nothing has been done to it, it has forgotten the fatigue and runs as well as ever. Gelatine melts or congeals at a definite temperature according to its composition, but a previous melting or congelation alters the point of temperature at which subsequent melting or congelation occurs. A beam of polarized light when passed through gelatine is rotated, but when the operation is repeated, there is a greater rotation for the same stimulus. I do not know how long these memories last in gelatine. From the physical point of view, protoplasm is not very far removed from gelatine, although it is certainly much more complex chemically, and of more elaborate physical structure, even in its simplest forms. Very roughly it may be said to differ from gelatine in the same sort of fashion that a complex machine like a motor car differs from a simple structure like a steel spring. It is therefore not surprising to find that the effect of a past stimulus is registered in protoplasm, more or less evanescently, so that repetition of the same stimulus produces a different response. The experiments and observations of many investigators who

have studied Protozoa with no ulterior aim provide endless examples of such events, and no small part of the work of those engaged in attempting to combat the diseases caused by the presence of parasitic micro-organisms can be stated in a few words that are not too fanciful, if we say that it consists in training the organisms to respond differently to accustomed stimulations, or to obey new stimulations. As in the ascending scale of the animal kingdom, parts of the protoplasm become specialized nerve-cells, and nerve-cells become aggregated into ganglia and brains, the machinery for the reception of stimulation, for retention of the results of stimulation, and for response to stimulation, becomes more and more elaborate, almost precisely as the behaviour of the whole organism lends itself better to statement in terms recalling human memory. But even in man, the action of memory does not necessarily involve consciousness. A sleep-walker, in complete ignorance of what he is about, will leave his room, go to a hiding-place in which he has tried to conceal a key from himself, and go out into the danger of the street. But add human consciousness to organic memory, and you have at once not only the simultaneous presence of immediate stimulus to action and the memory of past stimulation and its result, but the consciousness of the presence of these two factors. The more one reflects on the implications of the joint action of even two factors like present stimulus and organic memory, isolated, as they never are, from the many other factors in the field of consciousness, the more closely we approach a comprehension of the human sense of freedom.

Take another quality, the emotion of fear. Organisms at the bottom of the scale of life exhibit what physiologists call tropisms. Some move towards a supply of free oxygen or towards light, others away from oxygen or from light. These tropisms are subject to organic memory, and the effect of past stimulation may alter, or even reverse, a new stimulation, as when a slime-fungus, at first moving away from alcohol, "learns" to move towards it. On the whole the chemotropisms are such that protoplasm shrinks from what is harmful and towards what is helpful. If a crowd of the slipper-shaped animalculæ (*Paramecium*), distributed more or less evenly in a drop of water under the microscope, be disturbed by killing one of them (as may readily be done by pressing a hot needle on part of the cover-slip), the survivors withdraw from the neighbourhood of the corpse, leaving a clear ring round it. A picturesque vitalist has called this phenomenon "nekrophobia," fear of death, but all we know is that the survivors respond to a chemotropism, being repelled by some chemical emanation, or by the absence of a normal emanation, from the corpse. In the lower forms of life the attractions and repulsions are all comparatively simple, and it seems most easy to suppose that they do not act unless within the direct range of actual physical stimuli, mechanical and chemical contacts, waves of heat, light or sound and so forth. But in the ascending scale of life, the range is extended with the presence of more elaborate and highly specialized sense-organs, and these, with their complex organic memories, transform tropisms into a much more subtle and successful mode of appreciating good and

evil in the surroundings, transforming negative tropisms and their memory into what looks like fear, positive tropisms and the memory of them into what looks like pleasure. But they need not be conscious. A sleep-walker starts at an unexpected sound or puts up a hand to ward off a blow. A patient under the influence of laughing-gas may try to push away the dentist's hand or may cry out with a pain that he does not feel.

To my mind it seems certain that all the qualities in animals that foreshadow human qualities—instincts, experimental action, experience, memory with its consequences, the competition between immediate stimulus and the registered effects of past stimulus, states of pleasure and pain, all may precede consciousness. The separate cells and tissues of the human body exhibit the phenomena that vitalists claim as indications of consciousness and intelligence, quite as much as the cells and tissues of lower animals and of plants. In our own case we know that these parts of us operate outside the field of our consciousness; they continue their normal behaviour whether we are awake or asleep, and some of them survive our death, by minutes, hours, or days. Consciousness is something apart, different from these phenomena, but transforming them in an astonishing fashion. I am not prepared to say what it is, whether it be more than the coincident presence of many different factors. It may be that our difficulty about consciousness is no more than that, being among the trees, we cannot see the wood. But whatever consciousness be, it is no theory, inference, assumption, but the centre from which all human thought,

all science, all philosophy, all emotion, must set out in exploration of the universe and to which they must return. At the most we can conceive of it as dimly beginning in the lower animals, a little clearer in the apes, still clearer in savages, but even in ourselves intermittent. And it is consciousness that transforms all the qualities and faculties acquired by human beings from the animal world and that is the foundation of free and intelligent existence.

It is not the existence of alternatives, not unforeseeability or spontaneity but the consciousness of these that puts man and the nations he makes above the laws of the unconscious world. It is consciousness that gives man the power of being at once the actor, the spectator and the critic, that enables him to distinguish between self and not-self; and that brings with it the sense of responsibility and of reality.

I trace back to Kant the dreaming megalomania that has destroyed the German sense of reality and that has made German "Kultur" the enemy of the human race. Back to Kant, for *corruptio optimi pessima*. Nietzsche, of whom so much has been made, is a terminal flower of the tree of idealistic thought, beautiful, poisonous and sterile. No doubt he has got into the newspapers through Mr. Bernard Shaw, a very competent publicist whose antics were agreeable in times of peace. But even Mr. Shaw is only Nietzsche grinning through a horse-collar, a spectacle that his old patrons find indecent when there are serious affairs on hand.

Kant inherited from Plato through Berkeley, and transmitted to Hegel and Schopenhauer the doctrine

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that man is the maker of his own universe, and so destroyed the sense of reality. But even Kant admitted to being overwhelmed by two things that could fill the field of his consciousness. Every Kantian must remember the beautiful passage beginning: "Two things fill my mind with ever renewed wonder and awe the more often and deeper I dwell on them—the starry vault above me, and the moral law within me." We may well agree that the starry vault is a supreme example of the reality and externality of the physical universe. In an hour of quiet philosophy we can sit down and persuade ourselves that the softness and colours of our chair, the hardness of the table, even the distant rumour of the streets, all that we know of the extended world, and therefore the extended world itself, reside in our brain. In a moment of logical exaltation we can extend the idealism to include the Kaiser and von Bernhardi, Mr. Bernard Shaw and Sir Roger Casement—although the most logical mind would shrink from Berkeley's explanation of what happens to them when they are out of our thoughts. But not even Kant himself, not the most bulbous German brain, can refuse externality and reality to Sirius and Aldebaran, to meteors and comets, to the sun and planets in their courses, to the vast abysses of time and the recesses of star-sown space.

I agree with Kant in his selection of man's consciousness of the moral law as a second supreme wonder. But I disagree profoundly when he speaks of it as resident in the individual, transcendently or otherwise, and so reaches the beguiling phrases: "I am responsible only to myself; I am alone; I

am free ; I am lord of myself." Translate these phrases into political action and you get a nation like Germany crying out : " I am responsible only to myself ; in pursuing the objects that I think necessary, I need not care what any other nation in the world thinks, what any other nation in the past would have thought, or what any nation in the future will think of my conduct. I am alone ; I am free to do as I think right." And so Germany rushes on to what must be either her own doom, or the doom of the human race. Restrict them even to individual conduct, and you abandon the restraint of Latin discipline for the chaos of Gothic individualism.

Writing as a hard-shell Darwinian evolutionist, a lover of the scalpel and microscope, and of patient, empirical observation, as one who dislikes all forms of supernaturalism, and who does not shrink from the implications even of the phrase that thought is a secretion of the brain as bile is a secretion of the liver, I assert as a biological fact that the moral law is as real and as external to man as the starry vault. It has no secure seat in any single man or in any single nation. It is the work of the blood and tears of long generations of men. It is not in man, inborn or innate, but is enshrined in his traditions, in his customs, in his literature and his religion. Its creation and sustenance are the crowning glory of man, and his consciousness of it puts him in a high place above the animal world. Men live and die ; nations rise and fall, but the struggle of individual lives and of individual nations must be measured not by their immediate needs, but as they tend to the debasement or perfection of man's great achievement.

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Let me sum up my argument. It is asserted that war is just, necessary and admirable, and that this proposition is a deduction from biology. In the words of von Bernhardi: "Wherever we look in nature, we find that war is a fundamental law of development. This great verity, which has been recognized in past ages, has been convincingly demonstrated in modern times by Charles Darwin." I hope to have succeeded in showing:—

1. That even if the struggle for existence were a scientific law, it does not necessarily apply to human affairs.

2. That modern nations are not units of the same order as the units of the animal and vegetable kingdom from which the law of struggle for existence is a supposed inference.

3. That the struggle for existence as propounded by Charles Darwin, and as it can be followed in nature, has no resemblance with human warfare.

4. That man is not subject to the laws of the unconscious and that his conduct is to be judged not by them, but by its harmony with a real and external not-self that man has built up through the ages.

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